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PROBLEMS OF SCOTTISH SCENERY

By David L. Linton

In this year when the whole nation is participating in a Festival which is largely a centenary celebration, when the meeting of the British Association in Edinburgh will be made the occasion for reviews of progress in the various branches of science since 1851, and when geographers will be celebrating the centenary of the establishment of their own section within the Association, it would be only natural if the pages that follow were devoted to a historical review of progress in a branch of geographical science of particular and perennial interest to Scotsmen : the interpretation of Scottish scenery. Many readers of this *Magazine*, however, will remember that just this task was essayed and brilliantly discharged by Sir Edward, then Prof. E. B., Bailey seventeen years ago on the occasion of the Society's Jubilee.[1] When the centenary of the Society comes in 1984 it will be time for a younger writer to take his pen and continue the story from the point where Sir Edward left it, and we may hope that he will have much progress to record. At the moment it is problems rather than progress that must engage our attention. In the uphill march of our science we have reached one of those eminences which not only allows a long view back but relatively suddenly brings into view an enlarged perspective of the territory that lies ahead. The prospect is exhilarating, and I feel that I can best respond to the invitation extended to me if I attempt faithfully to portray that prospect as I see it.

Alexander Bremner and the Rivers of Scotland

At the outset I should like to pay tribute to the work of the late Dr Alexander Bremner. Over a period of more than thirty years he was a student of Scottish river development and glacial geology, several of his papers being published in this *Magazine*.[2] His mature views on the glacial geology of the part of Scotland he knew so intimately and had made particularly his own were presented to the Edinburgh

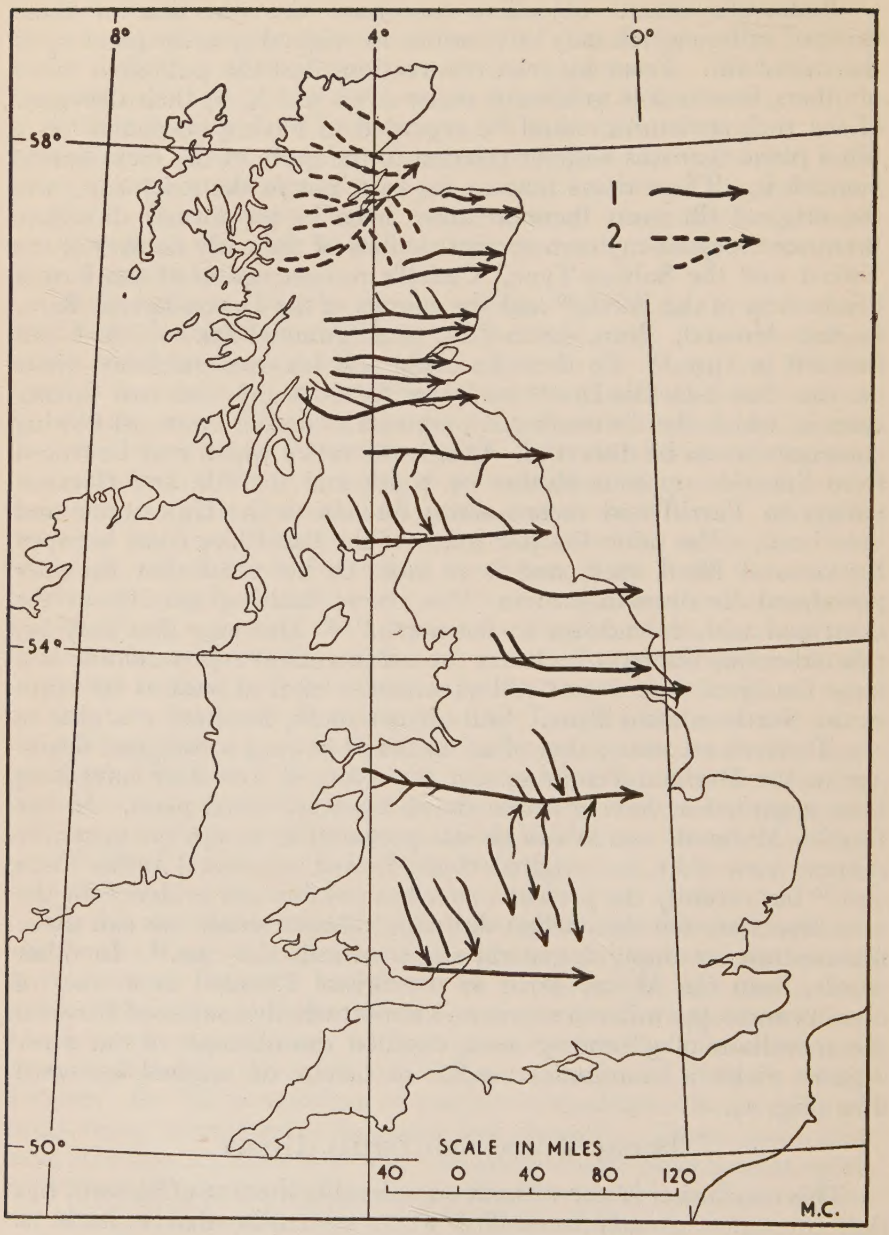


Fig. 1. The earliest British rivers, restored from their surviving remnants.
(1) Rivers presumed consequent on the initial post-Cretaceous uplift and eastward tilt.
(2) The possibly independent or later drainage of the Moray Firth depression.

rocks their special characters in quite remote times in the geological past. But the evolution of a landscape is not the same thing as the evolution of the rocks from which it has been fashioned, and the history of Scottish scenery begins, not in those early periods whose names are inscribed on our coloured geological maps but with the moment

> " When Britain first at Heaven's command
> Arose from out the azure main."

For Scotland at that time was truly just North Britain, as yet undifferentiated from the southern half of the island. The " azure main " was without doubt the Upper Cretaceous sea, with its flat floor newly carpeted with chalk of the Senonian stage. Our eastward-flowing rivers first took their courses on this sea-bed when it emerged and became dry land, what time the Danian and Maastrichtian chalks were being laid down in Belgium and Holland. From that day to this, that land surface has remained a land surface, and its rivers, or their dismembered remnants, have continued to run. Successive uplifts have raised it and possibly tilted it further during the sixty million years of Tertiary time that have since elapsed. At the extreme south, the part that now borders the English Channel was considerably distorted about half-way through that period. During those same sixty million years heat and frost, rock rotting by ground water, the erosive and scavenging action of rivers, and gnawing by the waves of the sea, have operated unceasingly, and for a time the powerful bulldozers and excavators of the glacial period made a conspicuous contribution to the task of wasting away what uplift had raised up. Scotland as we know it has been sculptured from the solid during Tertiary time. First the barely consolidated cover of chalk was cut through by the largest rivers, and the older rocks of the undermass were exposed in their valley floors, just as the Belgian rivers Dendre, Senne and Dyle in the country south of Brussels have cut through the Tertiary cover rocks and exposed the lower Palaeozoic schists and the granite of Ath. Later, the chalk would be wasted from the divides, but by that time the main rivers had bitten too deeply into the hard rocks below to be dislodged save by river capture and glacial accidents. In relatively short time, we may believe, the chalk was entirely removed except in the west where it had been armour-plated by the lavas of the Inner Hebrides, and near the eastern coastline where it had not been raised significantly above base-level. The erosive agents then began to discover the differences in resistance of the various portions of the undermass. Then, and not till then, those fundamental subdivisions of Scotland—the Highlands, Central Lowlands, and Southern Uplands—began to take shape as regions of contrasted scenery. The original unity of the uplifted and tilted block began to give way to the diversity we know to-day.

At this point a question inevitably obtrudes. If all Britain has been sculptured in Tertiary time from a single massive block, are there no remaining traces of the form of that block ? The original chalk cover has gone from northern and western Britain, stripped like wax from a sheet of glass. But what of the surface of the hard undermass from

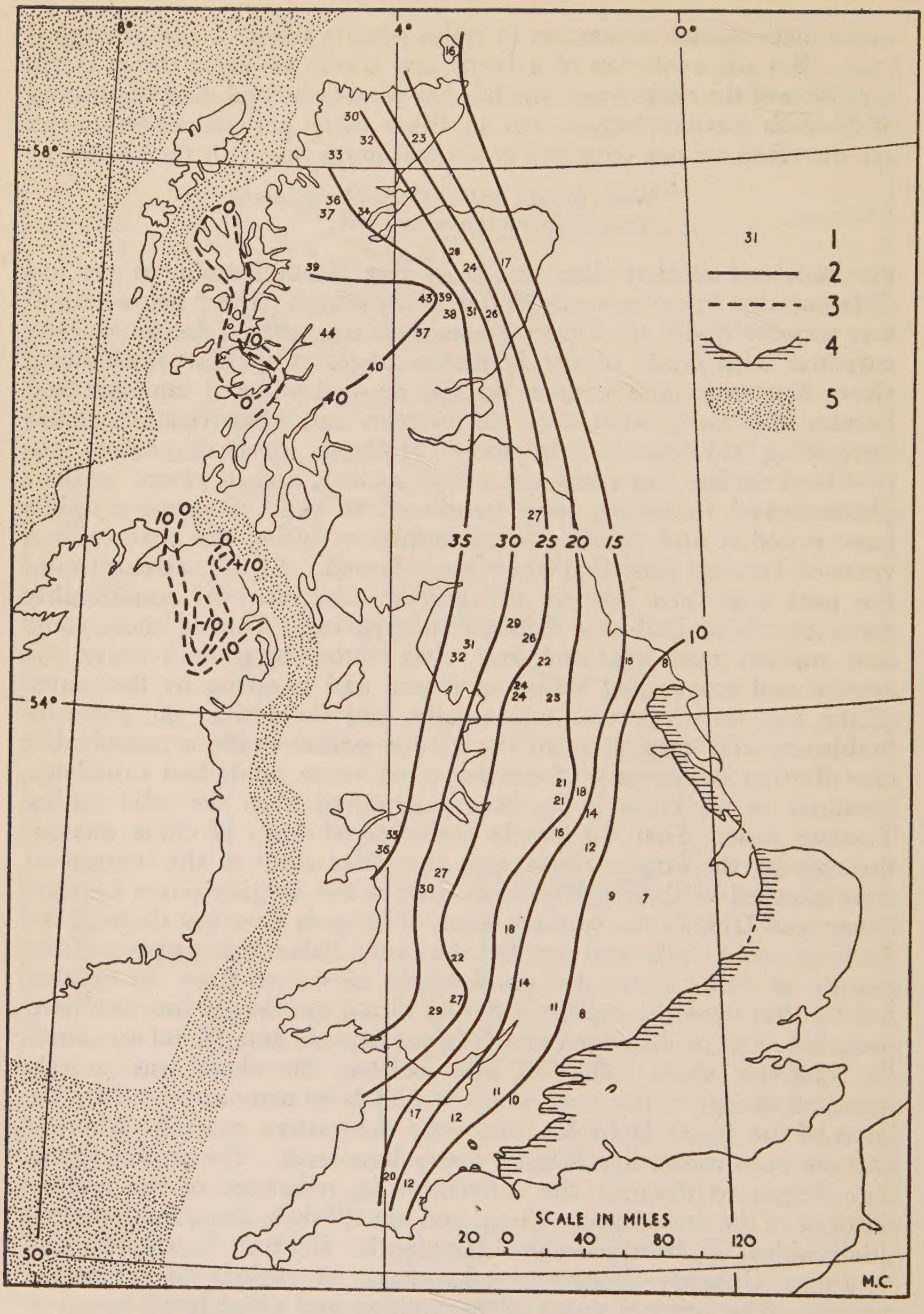


Fig. 2. Elements in the reconstruction of the earliest British land surface.

(1) Heights (in hundreds of feet) of the surviving most easterly high summits.

(2) Contours of a smooth surface that would touch these summits.

(3) Approximate stratum contours of the base of the Antrim and Hebridean lavas, below which thin Cenomanian strata are present in places.

(4) Outcrop of the Cenomanian strata of south and east England.

(5) Deeper parts of the Irish Sea, Minch, etc.

which the cover was removed? There are good reasons for thinking that this surface was very nearly plane. Bailey has argued from the general absence of terrigenous matter in the chalk of western Europe generally, and from the wind-blown character of the sand grains of the Cretaceous sandstones of the Hebrides, that the northern shores of the Chalk sea were fringed by a desert peneplain.[17] The great lateral extension of the Cenomanian sea from mainland Britain to Antrim and the Hebrides, coupled with the mere score or so of feet of the Cenomanian deposits in these areas, testifies eloquently to the negligible relief of the surface—the *sub-Cenomanian surface*—that was laid bare again when the Scottish Chalk was stripped and wasted away, and must effectively be the surface of the resistant masses from which the uplands of Britain have been fashioned. Is it possible to recognise any hint or vestige of this surface in the landscape of to-day? I think it is.

For any portion of this surface to survive, it must have suffered virtually no denudation since it lost its chalk capping. This can only be the case if it has occupied a watershed position ever since. Only a relatively small number of our higher peaks are likely to qualify for inclusion here. But there is a further condition to be satisfied—our rivers tell us that the surface of the block sloped to the east. With these considerations in mind, Fig. 2 has been constructed. The figures represent the altitudes, in hundreds of feet, of our most easterly high peaks, for only these are likely to have reached up to the sub-Cenomanian plane. They have not been selected by intuition or mere inspection but represent the result of successive processes of graphical elimination, which it would be out of place to discuss here. It may be taken that each summit is the most easterly of its altitude in its own latitude and is not flanked by higher summits to north and south along its own meridian. Between these plotted figures 'contours' have been drawn to represent the altitudes 20, 25, 30, 35 and 40 hundred feet (i.e. 2000, 2500, etc. feet). It will be seen that these contours are astonishingly regular. Between the meridians of 2° and 4° west, and a little further west in Highland Scotland, they portray a surface sloping eastward: almost due east in southern Scotland, a little south of east in the English Midlands and definitely north of east north of the Grampians. The confirmation of the testimony of the rivers is independent and striking. We may surely accept as a working hypothesis, to be put to the test whenever methods of doing so can be devised, that the summits mapped just rise to the level of the tilted and uplifted sub-Cenomanian surface. In particular we may note that the quite extensive surface of the Cairngorm summits at about 4000 feet which has frequently been noted as being far above the general level of Peach and Horne's "High Plateau,"[18, 19, 20] may in fact be an actual remnant of the sub-Cenomanian surface.

The eastward gradient shown by the contour lines of Fig. 2 is, of course, the cumulative result of several episodes of elevation and tilting throughout Tertiary time. The initial gradients were doubtless much less, but even so, they rose westwards. How far was this rise continued? Mackinder once speculated that, "north-westward, at any rate, even

the hundred fathom line does not mark the limit of the vast tabular block from which Scotland was carved." [21] No evidence lends any support to such a suggestion, but the facts shown in Fig. 2 are entirely consistent with the attractive hypothesis advanced by Cloos in 1939.[22]

Cloos had made a close study of such areas as the Rhineland, the Red Sea region, and East Africa, where large-scale rifting is prominent, and had concluded that this rifting was the consequence of an upward bulging of part of the earth's crust. After the upward bulging has reached a certain development, collapse of the most elevated area is likely to occur and to be associated with vulcanicity. Among the dome-shaped areas which Cloos recognised is the area of Great Britain and Ireland. Britain forms the eastern half of his bulge—and here we may note the significant eastward convexity of the contours of Fig. 2 ; Ireland and the Outer Hebrides form the western half. Between the two he shows a meridional rifted zone whose southern portion is suggested by the roughly parallel-sided trough whose sides descend sharply from the 30- to the 50-fathom line beneath the western Irish Sea. In the northern portion the plateau lavas of Antrim and the Inner Hebrides have been preserved from erosion by being faulted or warped down below Tertiary base-levels. If the sub-Cenomanian surface is indeed represented by the contours of Fig. 2, rising from 2000 feet about Stonehaven to some 4500 feet at Ben Nevis, then this same surface is depressed to about 1500 feet beneath the summit of Beinn Iadain in Morvern and descends to sea level on the shores of the Sound of Mull. At Strollamus in Skye, at Gribun on the west coast of Mull, and extensively in Antrim, the Chalk and Greensand deposits outcrop on the coast. It would appear that the crown of Cloos's arch must have been dropped down by an amount approaching 5000 feet.

It is worth noting that this viewpoint has an important corollary. If our eastward slope broke off toward the west along the margins of the " Hebridean Rift," there must from the outset have been two sets of rivers, the one set flowing eastward to the North Sea depression, and the other westward into the Rift.* The succession of high peaks that extends northwards from Ben Cruachan almost to Cape Wrath and roughly along the meridian of 5° W, must surely represent the line of the original watershed ; the peaks are, indeed, very difficult to explain on any other hypothesis. But here a difficulty arises. This zone of peaks is broken through again and again by low passes, mostly less than a thousand feet above sea level and two thousand feet below the peaks. It has long been customary, following the views of Mackinder and of Peach and Horne regarding the south-eastward tilt of the High Plateau, to explain these passes as having been cut by early consequent rivers heading far out over the Minch and the Sea of the Hebrides. Bremner continued to give currency to these ideas in his map of the " Tertiary Rivers of North Scotland " as late as 1942.[23] Sölch, however, has argued against this view. If these valley passes were made by eastward-flowing rivers, where, he asks, are the western mountains from which those rivers came ? Moreover, many of the islands and peninsulas west of the passes show erosion surfaces at levels above 1000 feet which were presumably fashioned by these western

rivers ; but Sölch finds it difficult to understand how the rivers that could open up these base-levelled lowlands should simultaneously or later have traversed the mountains in relatively narrow valleys. He therefore accepts the zone of peaks from Argyllshire to Sutherland as the zone of maximum uplift and leaves the problem of the through valleys to be explained in other, and possibly various, ways. To this problem we shall later return.

The Sculpturing of the Scottish Block

(i) *Adjustment to Structure.* As long as the original Scottish rivers flowed over a surface of chalk they may be supposed to have possessed a rough equality of opportunity. But as soon as the rocks beneath the chalk cover became at all largely uncovered, their great variety would advantage some streams much more than others. It goes without saying that the outcrops of soft rocks would be lowered much more rapidly than the hard rock areas, and it would seem that here at least no problems need arise. Would that it were so. The fact is that the soft rocks first exposed by the stripping of the chalk have been so effectively removed that it may take a generation or more of acute observation and inference to decide what and where they were. We will do well to look across the Border for a moment to bring our problem into focus.

On Fig. 2 the 3000-foot contour strikes in a bee-line from the Lake District to North Wales across the open Irish Sea. If these contours really have the significance we have here attached to them this means that along this line there was once solid rock from the level of the present sea-bed (*c.* 100 feet below sea-level) up to the sub-Cenomanian surface at 3000 feet, and these rocks have since been removed. Since Triassic rocks fringe this part of the Irish Sea, the rocks in question can only have belonged to the Upper Triassic, Jurassic, and Lower Cretaceous successions. The presence of the last may be regarded as highly improbable, and it is likely that the gap was chiefly filled by Jurassic rocks of the same type as those which build the hills of north-east Yorkshire.† Geologists have, of course, the alternative of assuming that the sub-Cenomanian surface was warped down over the Irish Sea to levels much below 3000 feet, just as Trotter has assumed a peneplain to be warped down to the 800-foot level in the Vale of Eden.[24] If they do, they may find the facts expressed in Fig. 2 very difficult to explain away. We prefer here to accept them at face value and to believe that the basin of the eastern Irish Sea has been opened by normal erosion in Tertiary time, and that the presence of a great thickness of relatively soft Jurassic rocks lifted high above base level was the very factor which allowed the western rivers to enlarge their territory so far to the east.

In Scotland similar problems arise. Peach and Horne long ago pointed out that the surface of the Southern Uplands is in part an exhumed surface. This is probably less true than they thought, but in the east the old massif is still partly buried by Old Red Sandstone, and in Dumfriesshire and Wigtown the deeper depressions contain

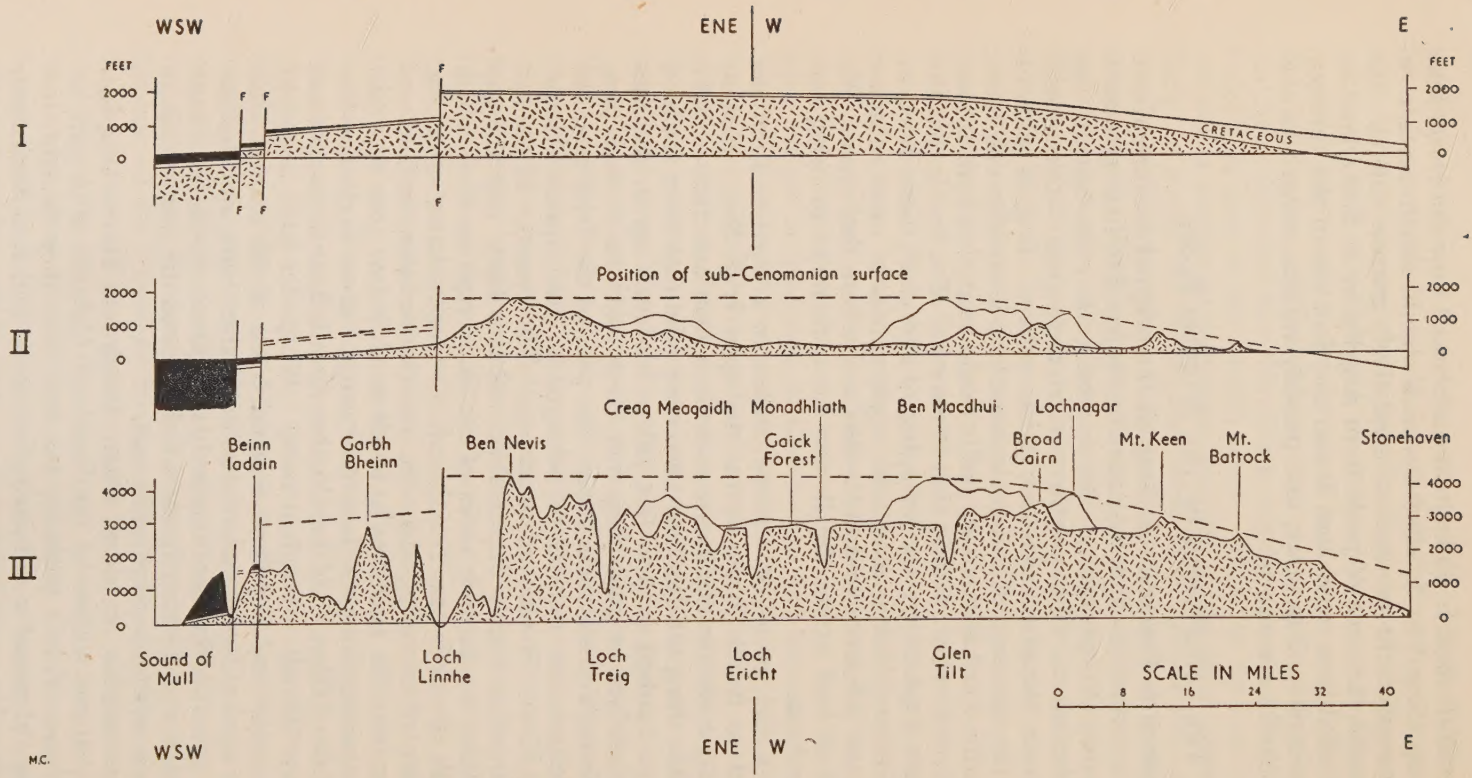


Fig. 3. An interpretation of some major relief features of the Scottish Highlands.

III. An approximate scale section through Morvern, Lochaber and the main Grampian watershed, to show present relief: Cairngorms, etc., projected on to line of section. Black=Tertiary lavas. White=Cretaceous deposits. Stippled=Granite and metamorphic rocks. The fault in Beinn Iadain is visible, the others are presumed.

II. A reconstruction of the same section at the end of the early Tertiary erosion cycle which produced the peneplain termed the Grampian Main Surface, when only part of the warping and faulting had been accomplished.

I. Reconstruction of the same section at a still earlier stage, when the main drainage was initiated on the presumed continuous cover of Upper Cretaceous strata. Warping as in II, but lava effusion and faulting in the west are shown at an early stage.

(Permian) New Red Sandstone. Over the site of Dumfries town a considerable thickness of Mesozoic rocks must formerly have been present, and the same is true around Mauchline in Ayrshire where the Permian rocks are only 200 feet above modern sea-level. That Triassic rocks once existed in the neighbourhood is shown by their preservation to this day in Arran, but that island doubtless lies in the downwarped or downfaulted zone of the " Hebridean Rift."

North of the Grampians, all writers from Geikie to Bremner have inferred a former wide extension of the Old Red Sandstone, and with excellent reason. It must be remembered also that Mesozoic rocks outcrop to-day on both sides of the Moray Firth, round Brora and Lossiemouth, and their presence beneath the firth itself is inferred from the travel of Jurassic erratics. Possibly these facts are to be associated in one way or another with Bremner's drainage reconstruction for the area. This is indicated by the broken lines of Fig. 1 and may be seen to be markedly centripetal and strikingly divergent from any rivers that could flow down the initial slope indicated by the contours of Fig. 2. There is a real discrepancy here that only further investigation will resolve.

(ii) *The Stages of Downcutting.* We have already noted that the uplift of the sub-Cenomanian surface by 4500 feet in the region of Ben Nevis was not achieved all at once. In fact the first uplift probably produced an " available relief " of only about a thousand feet in that same area. Peach and Horne regarded the general upland surface of the Grampians—their High Plateau—as a peneplain with monadnocks like Ben Nevis, Creag Meagaidh, and the Cairngorm mountains, rising some hundreds of feet above it.[25] Fleet notes the same relation and speaks of the *Grampian Summits* separated by a break of slope, which varies in altitude from 2500-2900 feet, from the *Grampian Main Surface.* Sölch recognises the same surface on both sides of the Spey at 800-900 metres,[26] and Louis identifies a 900-metre surface in the Cairngorms, above which rise the high mountains.[27] None of these authors, however, has adequately investigated the extension of this surface and its variations in altitude. Fleet's map is the most useful clue we have, and from it we may note the following interesting relations. Near the easternmost mapped development of this surface Mount Keen rises to 3077 feet as a monadnock above the peneplain at 2500 feet. On the other side of the Dee valley the peneplain forms the Dee-Don watershed at the same height, while the peak of Morven (2882 feet) is regarded as a monadnock. Further west the upland of Gaick Forest at 2900 feet is mapped as part of the Grampian Main Surface, and further west still the peneplain rises in the Monadhliath to 3087 feet unbroken by any monadnock. The peneplain is thus shown to rise westwards by some 600 feet in rather less than 50 miles. The gradient may be partly original but it is at least as likely to be due to renewed eastward tilting at the close of the early Tertiary erosion cycle in which the peneplain was produced (Fig. 3).

Below the level of the Grampian Main Surface, Fleet recognised a *Grampian Lower Surface* from 1400 to 2000 feet. This is doubtless the 500-600 metre surface recognised by Sölch on both sides of Strathspey,

and may be the surface he describes as descending from 450 metres round Loch Shin to 350-400 metres in Caithness : it is at the same general level as that which he claims to be extensively developed in the Campsie Fells at 450-500 metres and at 430-480 metres south of the Firth of Clyde, and that claimed by Ogilvie as being represented by the summits of the Central Lowlands at 1500 to 2000 feet.[28] Louis mentions a surface system in the Southern Uplands at 500 metres.[29]

On grounds of altitude Fleet's *Grampian Valley Benches* at 750-1000 feet may possibly be correlated with Peach and Horne's " Intermediate Plateau," with the surfaces noted by Sölch at 200-250 metres round Glasgow, rising to 300 metres in the Kilpatrick Hills, at 300 metres in narrow bands in Argyllshire and the west, and in the far north at 250-300 metres in inland Caithness but falling to 100-150 metres at the coast. Mort's " 1000-foot platform " with its upper limit at that level in Arran,[30] and Ogilvie's *Higher Lowland Peneplain* at 500-750 feet and rising in places to 1000 feet, may also belong here.

It might seem that here we have the skeleton of a denudation chronology for Scotland, but the authors whose observations have been quoted would not claim any such thing. If we make correlations on the basis of altitude alone, we may beg many questions and falsify the evidence, for by doing so we tacitly assume either that Scotland has been uplifted equally in all its parts, or that sea-level has fallen intermittently as the result of events that have nothing to do with Scotland, so that the fringes of Scotland have been successively uncovered as the falling tide exposes a sand bank. Either or neither may be the case. The labours of many workers will be required to trace what remains of the older valley floors on the sides of the present straths, and of the uplifted and dissected coastal platforms that may prove to be the work of rivers or of waves of the sea, before a connected and consistent story can be told regarding them.

(iii) *The Importance of Process.* When the geomorphologist speaks of ' process ' he refers to the varying forms which the general process of land-sculpture may assume at particular times and places. The nature of the erosive processes is in fact very closely associated with climate, and as we go from the frost-shattered mountains of the polar regions to the smooth bare-rock domes of the tropics we may see how differing processes may produce strikingly contrasted landforms from such a rock as granite which occurs everywhere. But, it may be interjected, Scotland displays no such range of climatic contrasts. This is a misleading view. The country has recently emerged from an Ice Age, and everyone now knows something of the scenic consequences of that episode. What is less readily apprehended is the fact that Scotland's earliest landscape evolution took place under quite other conditions. The Cretaceous sea, we have already noted, was fringed to the north by a desert peneplain, and the occurrence of wind-rounded quartz grains filling fissures penetrating the Chalk of Morvern has been interpreted as implying the continuance of desert conditions after the upheaval of the land.[31] The Eocene lavas were poured out on a land-surface which carried vegetation that included Magnolias and Proteas, and the lava surfaces themselves were weathered into ' bole ' that

resembles the lateritic red loams of the tropics. After the volcanic episode direct evidence is lacking, though the Lough Neagh clays which overlie the basalts of Antrim, and are possibly to be correlated with the presumed Oligocene beds of the Bovey Basin of Devonshire, testify to a continuance of conditions more like those of Portugal than Britain. How long these warm conditions prevailed in Scotland is not known, but in other parts of north-western Europe certainly until Miocene times. It is thus important to realise that the Grampian Main and Lower surfaces at least, and quite possibly even the Higher Lowland Peneplain of central Scotland, were fashioned under climates warmer than we enjoy to-day. The ice of later times has swept away the extensive mantle of rotted rock which formerly covered these surfaces and incorporated the material in the lowland drifts. But the ice did not everywhere refashion the underlying rock, and when we admire the abrupt decision with which Mount Keen rises above the Grampian Main Surface it may be that we are really looking at what was once a true inselberg and rose above a humid tropical peneplain.

There is, however, another aspect to this question of variations in the erosive process. Scotland has a weather side and a lee side which are strongly contrasted, and it is difficult to imagine any reasons why the contrast should not have been equally effective in later pre-glacial times. Stevens has rightly correlated with this climatic contrast the contrast in relief between the hill masses " of the lumpy coherent type of the Monadhliath and the Cairngorm " and " the deeply dissected chequered type of the Western Highlands." [32] The contrast we see to-day has certainly been heightened by the work of ice but was surely well established before the Ice Age. Nor is this all. Scotland's western outposts against the Atlantic weather—the Outer Hebrides, Coll, Tiree, Colonsay and Islay—are lowlands, but lowlands developed on our oldest and toughest rocks. Out of them rise isolated hills—the striking Eaval (1138 ft), for example, in North Uist, Hekla (1988 ft) and Beinn Mhòr (2034 ft) in South Uist, or the diminutive Carnan Mòr (460 ft) in Tiree or Beinn Tart a' Mhill (758 ft) in the Rhinns of Islay. It is difficult to regard these as other than monadnocks rising above base-levelled plains. These hills are made of the same materials as the plains and are a standing witness to the amount of material that has been removed and to the power of the erosive forces that have accomplished the base-levelling. These landscapes convey most forcibly the impression that the cycle of erosion advances to late maturity far more rapidly in the wetter west than in the east of the country.

(iv) *The Basins of the Highlands.* The Highlands of Scotland are the most extensive and most massive of all the British uplands and for this reason exhibit a greater range of regional variation in form than is to be found elsewhere. One feature in particular appears peculiar to them, namely, the development within the mountains of enclosed basins. Some of these basins have individually received mention by one or other of the writers on Highland scenery, but the problem which they present as a whole has yet to be studied.

These basins fall into three groups which are regionally and prob-

ably genetically distinct. The first group contains the best-known member—the basin which holds the Moor of Rannoch. The moor itself is a rolling lowland which is impressively overlooked from the west and southeast by mountains which rise 2000 feet and more above

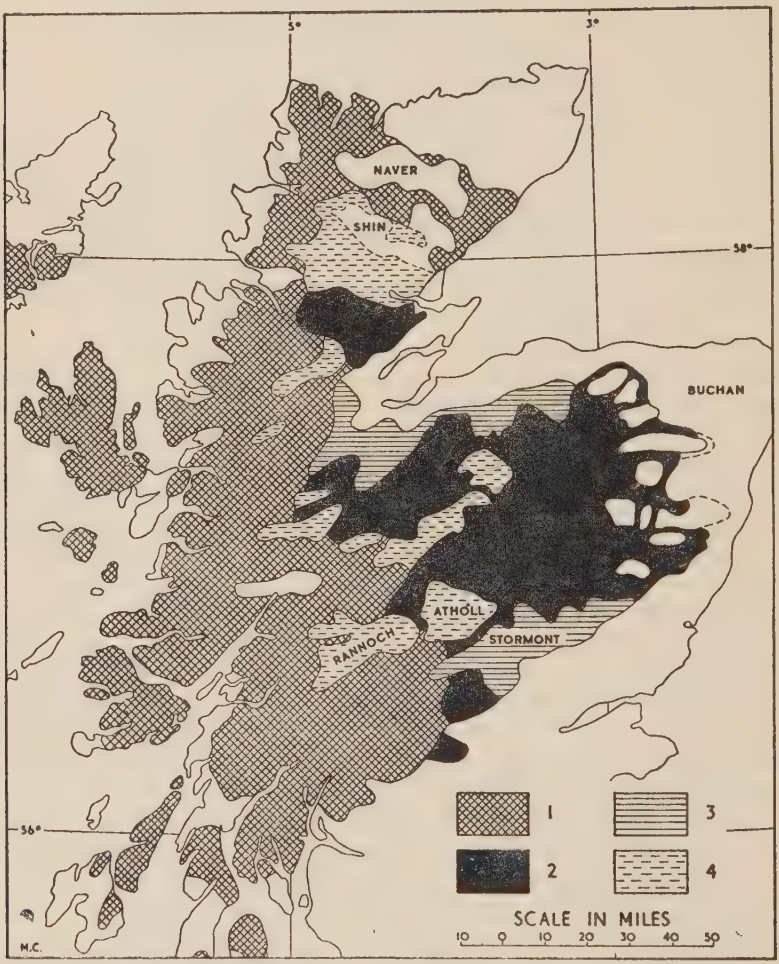


Fig. 4. The interior basins of Highland Scotland.
(1) The much fragmented Western Highlands.
(2) Massive uplands of Grampian type.
(3) Formerly base-levelled areas marginal to (2).
(4) Interior basins at levels relating them to (3).
Marginal lowlands, benches, and enclosed basins at lower levels, left blank.

it. But the *Rannoch Basin* is larger and holds, beside the moor, the Blackwater Reservoir and Loch Rannoch. High mountains border it to the north and it is shut in at its eastern, or outlet, end by Beinn a' Chuallaich (2925 ft) and Schichallion (3547 ft). Its lowest parts are at about 1000 feet but much of it belongs to the Grampian Lower

Surface. Much of it is floored by granite, but the relationship between the granite margin and the limits of the basin is very loose. Adjoining the Rannoch Basin to the north-east is the *Atholl Basin* closed to the south and east by Farragon Hill (2559 ft) and Ben Vrackie (2757 ft). The floor of this basin lies at 1500 or so feet, well above the modern valley floors that dissect it, and it too may be regarded as part of the Grampian Lower Surface. Unlike Rannoch it is developed entirely on schists. The Spey valley comprises a series of smaller basins of the same kind and at similar altitudes. The smallest and most inland is undissected and holds Loch Spey; the Kingussie Basin stretches from the Truim to Loch Alvie and is imperfectly separated from the basin of Rothiemurchus; the Abernethy Basin extends widely above Grantown and is dissected by both Spey and Dulnain.

The basins of the second group are developed on the eastern border of the Highlands, chiefly in Aberdeenshire. A glance at the geological map reminds us that here the terms ' Highland ' and ' Lowland ' have no relation to the underlying rocks. Banffshire is traversed by the same varied assemblage of metamorphic rocks from end to end, and the schists that build the Grampian southern boundary of Aberdeenshire pass under the lowland of Buchan and out to sea at Rattray Head. Nor is the distinction between Highland and Lowland one of igneous rocks, for while granites build the massifs of Lochnagar and Cairngorm, they also underlie the coastal lowlands at several points. The closed basins that we have here to note are obviously part of the expression of the transition from Highland to Lowland and they are found chiefly in the zone between 2° 30′ W and 3° 0′ W. They are much smaller and lower than the basins of the first group, and since they occur on the margins of the Highland their rims are lower also. Most striking and most typical is the Howe of Cromar, roughly circular with a diameter of 7 or 8 miles, largely floored and partly rimmed by granite. It is traversed excentrically by the Dee, which passes through two smaller basins on its way to Banchory. South of Banchory is the firmly closed basin of the Feugh, elongated from east to west, and across the Grampians in Angus the smaller and higher basin of Tarfside set more deeply in the hills. Below Banchory the Dee cuts straight across a wide lowland which may be regarded as a basin with a degraded eastern rim which the Dee passes at Cults: the manner in which the granite of the Hill of Fare rises steeply above the lowland developed on the same granite at its foot is as striking as it is puzzling. In the drainage of the Don the Howe of Alford is quite enclosed. North of it the long lowland floored by the Insch gabbro mass, and margined on the north by a line of hills developed from its metamorphic aureole, shows that in this case, however, the basin form is the result of differential erosion of rocks of contrasted resistance.

In the extreme north of Scotland the basin lowland is found in yet another form: a broken but often high mountain rim surmounts a large and hummocky lowland whose floor is strongly modified by glacial erosion and deposition. The most northerly basin is centred on Loch Naver and stretches WNW from Kildonan to the slopes of Ben

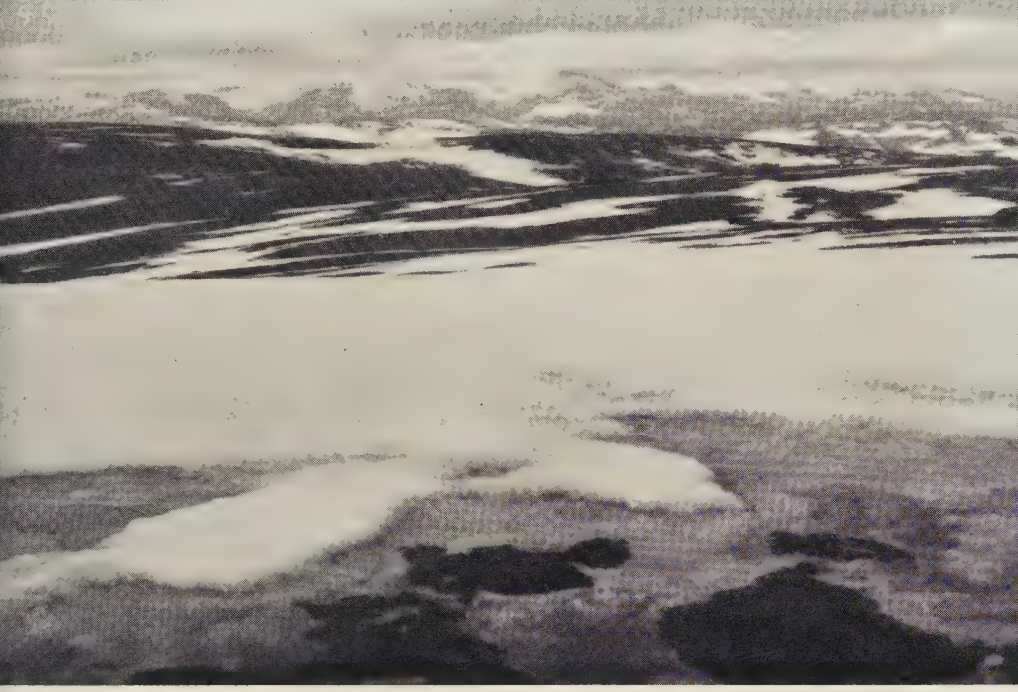
Hope. Behind Brora the smaller Strath Skinsdale basin is cut off from the sea by Beinn Dhorain and Ben Horn, but is open on its south-western side to the great composite basin that holds both Loch Shin and Strath Oykell. The outer limits of this latter basin are defined by the descent from the high summits to the glacially roughened surface that may perhaps be the same as the Grampian Lower Surface. This surface is cut by the widely open Strath Oykell and Glen Cassley and by the basin of Loch Shin with its own valley benches.

The problem presented by these three groups of basins can neither be dismissed nor, on present evidence, solved. Enough has been said to show that they are not generally determined by soft rock outcrops. A little may be gained by assuming that they represent a topography inherited from the irregular floor of the Old Red Sandstone. Some colour is lent to this hypothesis by the presence of a tiny outlier recorded by Bremner at the western end of the Feugh Basin, and of the widespread distribution of other outliers over north-east Scotland. But the Old Red rocks occur also as part of the bounding rim of both the Naver Basin (in the two Griams 1936 and 1903 feet) and the Shin Basin (in Creag Riabhach na Graidhe 1506 feet) as well as the hills that separate them from the coast.

Rather it seems we must interpret the basins as indicating the way in which reduction of the Highland mass has occurred. The Aberdeenshire basins, had they been enlarged a little more, would have become part of an enlarged lowland of Buchan. Some of them are indeed imperfectly separated from it, and on the lowland itself it is possible to recognise what look like the remains of others. They appear in fact to be local areas where base-levelling began—though we cannot see why—within the upland mass. Their floors may well have been opened up by rivers graded to that sea (? Pliocene) which left its flint and quartzite shingles on the flat-topped hills behind Cruden Bay.

Extending this interpretation to the larger interior basins of Atholl, Rannoch and the Spey, we may regard these as areas of local, but much more extensive, base-levelling within the upland formed during an earlier period of still-stand, that of the Grampian Lower Surface. Their occurrence right in the interior of the upland implies that base-levelling was much further advanced than it has ever been since. The Rannoch Basin is only just separated from that of Atholl, the Atholl Basin from the marginal platform represented by the summits of the Stormont hills.[33] The interior lowlands of the Spey seem to belong rather to the period of the Grampian Valley Benches and to be related to the coastal platform which planes the hills north of Keith, and west of Rothes, and from which the Knock Hill in Banffshire and the Knock of Braemoray rise as small monadnocks.

In the north of Scotland the former continuity of the basin floors with the base-levelled platform of north-east Sutherland and southern and western Caithness can hardly be doubted, and the same surface may be recognised beside Loch Shin. But the broadly opened basin below which the smaller basin of Loch Shin is sunk belongs no doubt to an older generation of features, though it would be idle speculation to attempt correlation with Flett's Grampian sequence.



The GRAMPIAN MAIN SURFACE cut across Dalradian schists and intrusive granite at 2600 to 2800 feet north of Glen Clova. In the background the large residual mass of the White Mounth rises decisively abo peneplain and culminates in Lochnagar 3786 feet. Looking NW.

BASE-LEVELLED SURFACES IN HIGHLAND SCOTLAND

The GRAMPIAN VALLEY BENCHES surviving in Glen Logie tributary to Glen Prosen. Heather-clad slope ormer mature landscape lead down from Cairn Inks 2483 feet and Cairn of Barns 2129 feet to the former loor at 1050-1150 feet. The wooded slopes from 1000 feet to the Prosen Water at 870 feet belong to a later

GHER LOWLAND PENEPLAIN in southern Midlothian. The view looks from the southern uplands Bounda Leadburn across the former valley plain of the North Esk developed on relatively weak Carboniferous ro Midlothian syncline, to the southern Pentlands, built of Old Red volcanics, beyond (Scauld Law 1898 fe 100-foot-deep incision of the North Esk toward the further side of the plain is marked by a line of woods

BASE-LEVELLED SURFACES IN LOWLAND SCOTLAND

levelled surface at 800 to 900 feet in Dumfriesshire which may be the equivalent of the Grampian Valley Bench Higher Lowland Peneplain. The slopes of Queensberry (2285 feet, extreme left) and the slightly dissect cially roughened lowland around Kinnelhead are built of the same closely folded Silurian rocks. Annanda is just beyond the skyline and 500 feet below the Kinnel Water.

The Scenic Effects of Glaciation

The great controversies of a generation ago regarding the capacity of glaciers to erode have almost died away and few echoes of them have been heard in recent years. The emphasis has shifted, and the problem of to-day is not *whether* glaciers eroded the Highland corries, lake-basins, stepped valleys, and fiords, but *how* that erosion was accomplished. Much light is being thrown on these problems by the work of Mr W. V. Lewis on corries and valley steps and in this work Scottish examples have contributed their share of evidence.[34] We cannot enter into discussion of such matters here but may perhaps turn with profit to a larger issue—that of the varying degree to which ice has modified the landscape of different parts of Scotland.

The divergence of opinion on this point was clearly brought out in the discussion that followed the delivery of a well-known paper on "The Fiords of the Hebrides" by Professor J. W. Gregory to the Royal Geographical Society of London in 1926.[35] Gregory's continued advocacy of the tectonic and essentially pre-glacial origin of fiords moved Sir John Flett to insist that "we have to remember that wherever fiords occur there is evidence of very intense glacial erosion, and that the great development of fiords in Scotland takes place in the district where the evidence is that glaciation was most active and vigorous." To this view that ice action was greatest in the west Gregory retorted that in his opinion "it was at least as great on the eastern side because the greatest area in Scotland above 4000 feet is on the eastern side" and that this area "would have had as great a snowfall as the western mountains." He speaks further of "the abundant evidence of glacial action on the eastern side" though it is "accompanied by no fiords and no deep rock basins."

A quarter of a century has passed and the indications are that Flett was right. The most "abundant evidence of glacial action" in eastern Scotland is, of course, the drift and this fact alone should have given Gregory pause. Students at our universities are taught, perhaps too facilely, that areas of glacial deposition are characteristic of the peripheral parts of ice masses as erosion is of their more vigorous central areas. Such a view would certainly suggest that eastern Scotland with its thick drift mantle attributable to more than one ice sheet had seen less erosion than the western mountains and troughs which are bare of all but the drifts of the last waning phases of glaciation. Probably Gregory was also influenced by the view that attributed the smooth flowing outlines of the Lammermuirs and the Mounth to the passage of ice across them. Geikie had taught that "there was doubtless far more angularity and ruggedness about the aspect of those ancient (i.e. pre-glacial) landscapes,"[36] and Bremner, writing of Deeside, held that "the smooth-flowing lines that everywhere meet the eye in a distant view are the direct result of the passage of the ice sheet."[37] We have since learned that such smooth flowing outlines are characteristic of unglaciated hills in a humid climate and, as Bailey rightly asserts, are connected with the burial of asperities under an accumulation of fine, creeping rock-waste. Quite different are the

glacially smoothed bare-rock surfaces — the roches moutonnées and the ' boiler plated ' valley walls—of the west. These, in any large view, do not compose a landscape of harmonious and flowing lines, but give rise to the surfaces for which Stevens makes appropriate use of the adjectives "mammillated," "pustulated," and "shagreened."

Interesting evidence has recently been put forward tending to show that strong erosion by ice may occur locally in areas which may otherwise have been little modified by it. The well-known passes of the Lairig Ghru and the Lairig an Lui which pierce the main axial ridge of the Cairngorms, and a number of passes which lead at surprisingly low levels through the main Grampian watershed (we may instance as examples Glen Tilt, the Pass of Drumochter, and the trenches which hold Loch Loch, Loch an Dùin, Loch Ericht and Loch Treig) are all of them deep glacial troughs but they can have had no pre-glacial antecedents. They are regarded as having been produced *de novo* by ice flowing across a high col in a watershed and gouging out for itself a deep trough valley.[38] Yet quite short distances away the uplands seem in places virtually un-modified by the ice. The flowing outlines of normal erosion, the accordant junctions and interlocking spurs of river-cut valleys, the terraced spurs and dissected valley-side benches that testify to pre-glacial periods of partial base-levelling are all in evidence. Even the mantle of deeply weathered and rotted rock that must everywhere have covered the pre-glacial land surface survives in places [39] sometimes covered by what appear to be solifluction deposits and even by boulder clay.[40] Finally, it may be suggested that the ' tors ' which are such conspicuous features of certain of the Cairngorm mountains, e.g. Beinn Mheadhoin (3883 ft) and Ben Avon (3843 ft), and rise from their smooth summits like warts from a fair skin, are, like the exactly similar tors of unglaciated Dartmoor, features that can only be produced by a long period of weathering that cannot have occurred during or since the last glaciation of these mountains and may well be pre-glacial.[41]

Taken all in all there seems good reason to think that away from the main ice-streams considerable areas of upland in the eastern Highlands, and perhaps also in south-east Scotland in Lammermuir and Cheviot, have suffered little if at all at the hands of the ice.

In areas of vigorous ice-streaming, on the other hand, erosion was powerful and deep. The restriction of fiords and trough lakes to the west that was noted by Gregory and Stevens, is better thought of as restriction of such features to the area now on the wetter side of the sixty-inch isohyet. From the mountain areas of Argyllshire and Dumbarton loch-filled troughs lead outwards to SW, S, SE and even E (Loch Vennachar, Loch Voil and Loch Earn). From the mountains and basins of Sutherland and Ross they lead NW, N, NE and SE (Loch Shin, Loch Glass, etc.). In between is an area of country from which ice is known to have been extruded right through the eastern Highlands by way of the Tummel and Spey as well as by Glenmore, but which can hardly have been adequately discharged of its ice by this means. To-day these mountains have rainfalls of 100-200 inches, and their primacy in precipitation may have been equally

marked in glacial times. It is in these mountains, moreover, that the main watershed between the Atlantic and North Sea drainages lies so often on the floor of a trough leading through the mountains. Here are the valley-passes that were mentioned earlier as being widely interpreted as the products of old consequent rivers that had their courses in some now vanished north-western mountains. A simpler solution seems ready to hand and was advanced by H. Louis in 1936 [42] and independently by myself in 1949,[43] namely, that the main area of ice accumulation lay east of the mountains and the Atlantic-North Sea watershed, and that the latter was therefore extensively over-run and breached by the westward streaming ice.

No more can be said in this already lengthy survey. But it will be apparent that recent work in the interpretation of Scottish scenery has in no way diminished the territory that remains to be explored. Each increase in the view merely serves to bring into sight a new horizon towards which effort may strive. Perhaps, however, we begin to discern something of the shape of the full task that lies ahead. The understanding of our landscape involves nothing less than the tracing of its history in all its aspects throughout the whole span of Tertiary time.

* Readers of Geikie's *Scenery of Scotland* may remember the striking description of the Sgùrr of Eigg (pp. 167-172, 3rd Edn.) which he interpreted as a series of acid lava flows occupying a valley cut into the earlier basalt lavas. Since Geikie wrote, the origin of the pitchstone has been in dispute, but Geikie's description of the gravels upon which the pitchstone rests (with their water-worn shingle, fragments of Torridon sandstone and abundance of coniferous wood) appears to be excellent and direct evidence of the existence of one of these westward flowing streams.

† In north-east Yorkshire there are some 3450 feet of Jurassic sediments from the Rhaetic to the Kimmeridge Clay ; in the Inner Hebrides rocks of the same age total 3000 feet.

The illustrations are reproduced from photographs by the author.

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THE ISLE OF HARRIS

By J. B. Caird

The Isle of Harris is one of the most attractive of the Hebridean island chain off the north west coast of Scotland.* In comparison with the rest of the Hebrides, Harris has a much larger proportion of high ground, and the hills of North Harris, culminating in The Clisham (2622 feet), are the highest in the Outer Isles. The lime-rich *machair*, large stretches of which constitute a redeeming feature of the Uists, Benbecula and Barra, is very limited in extent. Neither is there any flat ground facing the Minch suitable for the development of a large harbour and fishing centre such as Stornoway. In no other island are so many of the crofts dependent on lazy-beds for their cultivated area, nor has the land of the Southern Hebrides been so thoroughly combed for cultivable ground. Even to-day, creels of seaweed are carried up from the beaches on human backs, in an area—' The Bays '—where no horse is to be found. Ninety-six per cent. of the island consists of bare ice-scraped rock or peaty moorland ; of the surface only one per cent. is cultivated.

In no other area of Britain is the settlement so completely peripheral : no dwelling is beyond the sound of the waves. The crofts are smaller than those of the Southern Hebrides, where they are often like

small farms. The pressure of population on land in East Harris, with densities on the improved land of over 500 per square mile, is the legacy of the complete clearance of the Atlantic coastland during the first half of the nineteenth century. Yet, in spite of the poverty of the environment, the population has not declined so very greatly since its late 1911 peak : Harris to 77 per cent., North Uist to 64 per cent. As in Barra, where the population has dropped to 81 per cent., the explanation is to be found in the strong secondary industry—in Barra, fishing ; in Harris, weaving.

Even with the fluctuating fortunes of the tweed industry, it is surprising that the population of this backward fringe of industrial Britain has only declined by 23 per cent. since 1911. The older people are content ; the young leave for the greater opportunities of the mainland, some having had a foretaste through conscription or schooldays in Inverness. There is a marked lack of community life which might encourage some of the people to remain : for this the strict tenets of the Hebridean Church must be taken into account.

With its varied environment : the close juxtaposition of land and sea ; the contrasts of a wild east coast of deep, cliff-bound inlets, and a west coast of sand-filled bays ; low, loch-studded surfaces and high hills separated by deep, drift-filled valleys ; heathery tussock moors ; and the sparkling colours of the machair—Harris has great charm for the visitor. The natural endowments are enhanced by the kindness and hospitality of the Gaelic-speaking people of this outer fringe of Scotland.

The Physical Basis

The geological structure consists of NW/SE-trending Lewisian gneisses, varying in strength and texture, and interrupted by crush lines and, on the ' Bays ' coast, by shatter-belts.[1] The interior of the island presents a very mountainous landscape of bare, rocky moorland, rising to 2622 feet in North, and 1654 feet in South Harris, a poor area pastured by a small strain of Black-faced sheep.

The coasts are the vital areas of Harris, for all the arable land and almost every house is within sight of the sea. East and west present a strong contrast in coastal type ; the Minch coast, grey and inhospitable, characterised by deep inlets and detached islands, differs sharply from the long, inviting shell-sand beaches of the Atlantic shores, without anchorage, but blessed with the attractive and fertile machairland sparkling with gaily coloured flowers above the long, creaming Atlantic rollers.

Shell-sand is the most striking feature of the Atlantic coast. Where it is blowing, dunes form and are slowly stabilised by *mùran* or sea-bent (*Psamma arenaria*). The process is at the moment taking place at Scarasta ; in the past four years, a dozen small dunes have appeared, now bound by this useful grass. It has been suggested that driftwood may have formed the nucleus of these very recent additions to the landscape. Changes are constantly taking place : in Berneray some of the large dunes have disappeared in the last forty years ; a crofter mentions that a fence on Scarasta machair was buried within five years

of erection, in the oncoming sand. But the seeming menace of the encroaching sand sweetens the acid peat, and the shell-sand, when colonised by nitrogenous legumes such as clover, vetches, and hop trefoil, provides a light, lime-rich, early soil, eminently suitable for root crops and cattle pasturage. The underlying clay, left on this 'leeward' side, in parts as high as the 150-foot contour, by the north-westward movement of the ice sheet, provides a moisture reservoir, and enables crops to be grown in pure sand. Machairland can only be cultivated for three successive years and must then be left fallow for a similar period, or blowing—leading to dune formation—may result.

The cliff-bound Minch coastland is much less favourable. There is no enriching expanse of sand : peaty, rubble-filled hollows and bare rock slabs dominate the scene. Yet this is the more densely populated shore, a surprising feature elucidated by the island's history. Small paths wind down the ice-etched valleys among the minute lazy-beds to the source of the fertilising sea-ware and the sheltered anchorages of the small ring-netters and lobster-boats.

The drainage of the island is notable for the high stream density. Formerly these short, steep torrents were utilised to drive the tacksman's corn-mill ; to-day their dynamic value would be vested in hydro-electric potential but for the fact that a feature of all the larger lochs is their proximity to sea-level. The resultant lack of head, in addition to the isolation and the great depth of drift in the valleys, would make engineering extremely costly. As a cheaper alternative, individual 'Free-light' installations harnessing the ever-present wind are already part of the landscape.

The climate of Harris may be described as 'temperate oceanic.' The most notable features are : low temperature range : 15° F. at Stornoway, the nearest full meteorological station ; moderate to heavy rainfall : 45 to 76 inches on the coastland ; high mean annual cloudiness ; and strong wind incidence. The period from April to June is driest, but the sunshine effectiveness is not then at its maximum. The laggard spring shortens the agricultural season, during which growth is sluggish owing to the low summer temperatures ; the ripening and harvesting of the grain is uncertain in a rainy autumn.

The climate has a controlling effect on the natural as well as the cultivated vegetation.[2] The poorly aerated soils and deep peat do not encourage tree-growth which, in any case, has a formidable opponent in wind. That the island was colonised by trees in pre-Norse times is indicated by the presence of trunks and branches—some of them charred—in the peat banks : Scots pine, birch, and alder. Some of the trunks are used in the 'Bays' townships for repairing boats. The destruction of the forest was mainly carried out in Norse times, as the place-name 'Luskentyre' (Gael. *loisg an tire*=the place of the burned wood) suggests.

Patches of stunted woodland occur at various points ; fifty-year-old Scots pines at Borve Harris scarcely exceed ten feet, but Sitka spruce rise to thirty-five feet in a more sheltered position. There is an increasing interest on the part of the crofters in trees for shelter, and willows, rowans, and fuchsia are to be seen on some crofts. In Tarbert

sycamores flourish, and an occasional hydrangea is to be seen in the gardens, proving that, given shelter, plant and tree growth is possible. Islands in lochs, where neither man nor his flocks can interfere, show the climax vegetation : heather, dwarf rowan, honeysuckle, and, strangely, bracken, which is rare elsewhere in Harris.

The Rural Economy

The rural economy of Harris is closely adapted to the rather unprepossessing environment. The land, at one time the people's through clan ownership, is laid out in the ancient system of crofts, involving a simple economy which consists of small-scale stock-raising for wool and mutton, self-sufficiency in vegetables, milk and eggs, and primarily the raising of store cattle to be fattened on the richer pastures of Lowland Britain. The croft must be supplemented by part-time weaving or fishing to provide an adequate cash income.

Agriculture.—Soils in Harris are generally poor and range from pure sand, through clay, to peat. The drift-covered gneiss, combined with heavy rainfall and low evaporation, gives a poorly aerated, leached soil, deficient in lime, nitrates, and potash. Exceptions occur on the Atlantic shore ; pure, inblown sand, colonised by machair plants, forms a well-drained early soil, which, however, requires generous dressings of sea-ware or artificial manures to give a crop.

Statistics of Agricultural Land Use

INBYELAND			HILL GRAZING	LIVE-STOCK	
TILLAGE		PERMANENT GRASS			
Oats	887				
Rye	29			Sheep	49,449
Bere	29			Cattle	2,223
Potatoes	239			Poultry	14,003
Turnips	2			Horses	76
Vegetables	5				
Fallow	119				
ACREAGE	1310	4541	80,679		

Cultivation is everywhere determined by the configuration of the topography and available soil. The peripheral inbyeland—that is, the area within the township dyke—constitutes only four per cent. of the land surface. One-third of this improved land, won through the ages from the barren moor, is devoted to crops : oats, hay, potatoes, bere (*Hordeum vulgare*—a four-rowed barley) and rye, in order of importance, the cereals being grown solely for stock-feeding. The remainder of the land, with the exception of the islands of Ensay, Killegray, Pabbay, and Taransay, is utilised as common grazing, and stocked with 40,000 sheep.

The croft is the sole agricultural unit, except for the island grazings. The holdings vary in size, lay-out, and husbandry in the two sharply contrasted regions of the ' Bays,' and the ' West Side.'

	' THE BAYS ': OBAN	' WEST SIDE ': NORTHTON	ISLANDS: PABBAY
Arable acres	3½	5	—
Crops .	Hay	Hay	—
	Oats	Oats	
	Potatoes	Potatoes	
		Bere or Rye	
Cultivation	Spade	Plough	—
Cows .	2	5	50
Stirks .	Calves not reared	2	—
Horses .	—	1	—
Sheep .	40	35	100

The ' Bays ' crofts mostly date from the Clearance epoch (1816-1854) when the islanders evicted from the richer Atlantic shores were faced with the choice of emigration, or making their crofts on the shores of the Minch where their sheilings were situated. The cultivated area is solely composed of lazy-beds or *feannagan*, as a horse and plough could not work among the tiny patches of shallow soil separated by solid rock. The patch is divided into strips about four feet wide and varying in length, each separated from its neighbour by open drains ; the soil from the drains is placed on the beds to increase the depth and for renewal of fertility. The sides of the beds are reinforced by turfs, and the hard-won strips are then cultivated crosswise, to-day with a spade, in the past with the *cas-chrom* or foot-plough.

Each lazy-bed has been reclaimed from the moor, and every pocket of soil among the rocks and lochans within reach of the township has been utilised in the past hundred years. At present, only one-third of the maximum cultivated area is used, the remainder being given up through exhaustion or because of distance from the source of the fertilising sea-ware. Reduction in man-power is another factor : in the mid-nineteenth century it was not uncommon for the crofter and six sons to be home for the spring work.

The average ' Bays ' croft consists of a nominal four to five acres of arable land scattered in the township inbyeland. The qualifying ' nominal ' emphasises the fact that not all the five acres are cultivated —some literally cannot be, as they consist of bare gneiss and the drains separating the lazy-beds. Thus about two-thirds of the five acres is under oats, potatoes, and meadow hay, a form of fallow. Within the dyke there is sometimes an ' out-run ' or private grazing area where the cows are tethered to keep them off the unfenced lazy-beds during the growing season. Grazing on the common pasture is controlled by the Township Grazing Committee which fixes the ' souming '—the number of sheep to be grazed by each crofter. The souming and the area cultivated may vary, but the essential thousand-year-old agricultural pattern remains.

The Atlantic shore of Harris with its great stretches of sand was the

traditional home of the Harrisman. Lazy-beds, reaching to the five-hundred foot contour, seam the bare hillside. This area, for sixty years after the evictions under farms, was re-settled after 1900 by cottars from the over-crowded 'Bays' under the auspices of the Department of Agriculture. In the early schemes at Northton and Borve Berneray, the crofts were made much too small, but on the later settlements around Seilebost, both the individual holdings and the grazings have been increased.

Northton, the largest 'West Side' township, consists of thirty-six holdings of five acres arable, and a souming of thirty-five sheep, three cows, and one horse. The arable land consists of two-and-a-half acres round the house, and a similar area in strips on the machair. The flat nature of the land, reclaimed in the early years of this century from degenerate pasture, permits ploughing, some by horse, but mainly by tractor hired from an enterprising member of the township or from the Harris Crofters' Association, formed in 1946 with the purpose of furthering agriculture, weaving and fishing. The land was formerly all manured by sea-ware shared out by the township constable, but nowadays artificial fertilisers are mainly used.

On the heavier land round the house, oats, bere, and three-years hay are grown, the bere acting as a nurse crop for the young grass. Small oats (*Avena strigosa*) and potatoes have pride of place on the machair—where the standard of cultivation is poor, judging by the numerous corn-cockle and other weeds among the crops. The machair must be rested after three years or sandblowing may commence.

In the 'Bays' and on the 'West Side' the stock kept consists of Shorthorn and Highland cattle, mostly crosses, and a poor strain of Black-faced sheep. In spite of the fact that the Department of Agriculture lends pedigree bulls and rams to the townships, the stock will remain poor until the over-stocking on the common-grazings is reduced.

Crofting problems distinctly differ from those of farming. The crofter and his family represent a much larger unit of labour per acre, and their task is to produce the largest possible yield from land of limited fertility. The Harris Crofters' Association at its headquarters at Borve has successfully experimented with the growing of early vegetables, and a greater area of machair could be devoted to raising early potatoes, carrots and green vegetables, the produce to be marketed in the larger centres in Lewis and Harris or on the west coast of Scotland. Market gardening on Boreray, off the coast of North Uist, has been very successful of late.

The Tweed Industry.—Crofting alone has never made Harris prosperous : indeed, it is a striking feature of the island's history that times of reasonable prosperity have coincided with flourishing supporting industries—notably the manufacture of kelp and tweed.

Slack periods on the croft, and the large number of rainy days, make the lucrative tweed-weaving a perfect supplement to the croft work, as the loom can be operated in spare time. As two of the Hebridean homecrafts practised for hundreds of years to meet purely local needs, hand spinning and weaving formed the basis of this now world-famous industry.

Tweeds came into fashion among the gentry towards the end of the nineteenth century, when the Countess of Dunmore popularised the hand-woven Harris tweed with its attraction of natural dyes and seldom-repeated patterns for sporting and country clothes. The weaving side of the industry has remained little affected by the industrial development, but the Stornoway and Tarbert mills have taken over practically every other process : dyeing, carding, spinning and finishing. The carding and spinning mill in Tarbert, with about forty employees, commenced production in 1900, followed in 1924 by a smaller mill at Geocrab in the ' Bays.'

In 1947, with production at its height, two hundred looms were operating. Output varies : a loom worked for a forty-eight-hour week might produce four thousand yards of tweed annually, but this is solely an academic statement as it neglects the ever-present croft work, and probably two thousand five hundred yards represent the maximum amount of time a crofter can usefully give. Hand spinning is similarly affected by croft work—a week of evening work may only produce two pounds of ' weft ' yarn. ' Warp,' requiring more twist and strength, is nearly all mill-spun, the combination of hand-spun weft and mill-spun warp giving the ' fifty-fifty ' hand-woven tweed.

The modern Tarbert mill has machinery including teasers, three carding machines, and four sets of mule spindles. The wool used comes mostly from the mainland and is washed and dyed in Stornoway. The finished spun wool is sent either to Stornoway or to the Harris crofts. The smaller Geocrab mill deals with the Harris clip.

Following the war-time and post-war boom periods, the industry is now in a difficult position as a decrease in demand, mainly due to the imposition of a 66⅔ per cent. purchase tax, has thrown many weavers out of work ; thousands of yards of tweed are wasting on the crofts ; many newly-bought looms lie idle ; and, as a result of the depression in the industry, many of the men are leaving home for work on the mainland. As the prosperity, not only of Harris but of the Hebrides as a whole, depends on the fortunes of the tweed industry, there is a strong case for the reduction or abolition of the tax.

Supplementary to the tweed industry is the small-scale knitting of Harris wool pullovers and stockings. The tweed industry is another example of the croft labour team : the wife spins and the children fill bobbins while the crofter weaves.

Fishing.—Fishing has for centuries been an important and essential part of the life of the islands. The Dutch were first in the commercial field in the seventeenth century ; intermittent prosperity held till the mid-1920's, when the trade slump coincided in Harris with the abandonment in 1924 of Lord Leverhulme's scheme for developing the fishing industry based in Leverburgh. Like tweed, fishing too can be fitted into croft routine. At present there are few professional fishermen, as marketing and transport costs eat up much of the profit.

The Harris fishing industry is concentrated in the ' Bays '—and mainly on the island of Scalpay, where the industry explains the apparently anomalous population of over 600 in the 1931 census. Before the present depression, 25 boats were operating from Scalpay

and 2 curing sheds dealt with the catches. The curing sheds closed down in 1941 for lack of female labour and have never been reopened. Only 6 boats were operating from the island in the summer of 1949.

The lobster industry on the rocky shores has recently been encouraged by the reopening of the Stockinish Lobster Pond, a walled-off arm of the sea, originally completed in 1820. The season lasts all year apart from a six-week break in high summer when the boats are taken ashore for repairs and refitting. To-day lobsters are the most remunerative aspect of Harris fishing, as they will stand the high transport charges to distant markets.

In the spring of 1950 the whaling station at Bunaveneader, three miles out of Tarbert on the Atlantic coast, was reopened after lying derelict since 1928. Catches are mainly of the common rorqual, blue whale and Atlantic right whale ; this new venture is employing about thirty men.

During the winter and spring months a limited amount of white fishing with long lines is carried on. Local fishing from rowing boats to provide saith, lythe, and mackerel for the home is a social occasion of the summer months. Strictly preserved sea-trout and salmon fishing attracts anglers and provides employment for ghillies during the salmon season (May-September).

Minerals.—The Pre-Cambrian rocks of Scotland, in contrast with many parts of the world, are not rich in minerals ; but during the 1939-45 war, feldspar was quarried at Northton and Lingarbay. The mineral was despatched to the Potteries district for manufacture into porcelain insulators. These quarries employed about sixty men and from 1941 supplied the bulk of the United Kingdom requirements in feldspar. With the return of open market conditions there appears to be little prospect of the quarries being reopened, as the price would have to be reduced by more than half to compete with the Scandinavian product.

The main reasons for the high price were the low proportional yield at the quarry and the high cost of transport, the latter a ubiquitous and persistent problem in the Highland area. The high transport cost in Harris was due to high freight charges, the poor state of the road between the quarries and Leverburgh pier, and the nature of the port itself, which could only take small cargo boats and necessitated hand-loading.

Tourism.—With magnificent scenery, stretches of beautiful sand, and excellent angling, a croft tourist industry might well be expected. On the contrary it is little developed, as Harris, apart from Tarbert and Leverburgh, lacks a tap-water supply and indoor sanitation. Once the proposed water schemes, scheduled to start in 1951, are completed, development will follow.

The Evolution of the Human Pattern

The human pattern of the Isle of Harris evolved through the centuries is closely linked to the physical environment and its possibilities. Man in his turn has acted on, and altered, the natural landscape through settlement and cultivation.

Prehistoric finds and remains suggest that the more inviting Atlantic shores were early settled by the migrating Megalithic and Celtic peoples : souterrains, standing stones and dun-sites, the last once hill-top or island forts, remain to tell the story of Harris in early times. Christianity reached Harris from Iona, as evidenced by the remains of small chapels. During the ninth century the small population was overwhelmed by the Norse invaders of whom the place-names are the only traces.

The termination of Norse supremacy in the thirteenth century was followed by the rise of the clan system, which lasted till late in the eighteenth century. Land was given to retainers in return for services.

The 1745 Rebellion resulted in the break-up of the clan system, which was replaced by the stricter landlord-tenant relationship. The land was parcelled out in ' tacks ' to the ' tacksmen '—usually relatives of the landlord. A tack might consist of twenty ' pennylands ' each of which was rented to four sub-tenants grouped in a ' farm-town ' or *baile*.[3] The tacksman had a lease : his sub-tenants were tenants-at-will.[4] The lowest class of all was the ' scallag ' (*sgalag*), the tacksman's servant, who worked five days for his employer for a trifling wage, and on the sixth day was allowed to cultivate the ' kailyard ' beside his hut ; the sticks of the latter he carried with him if he moved to another tacksman. Sometimes the scallag was better off than the sub-tenant who, in addition to paying rent, was liable for services to his landlord.[5]

The lucrative kelp industry made Harris prosperous from about 1770 till 1825. Kelp, the ash derived from the burning of seaweed, was a source of soda, iodine and potash. So successful was the industry that holdings could be subdivided and rents were doubled without much hardship at the time. However, when chemical discoveries and industrial production destroyed the industry—the value of the product dropping from £2180 in 1825 to £280 in 1828 [6]—the expanded population, which had doubled between 1755 and 1830, could not meet the rents. The proprietors were soon in financial straits, and the failure of the industry was one of the causes of the evictions.

From 1820 onwards the letting of land for sheep farms was becoming lucrative : the crofters were in arrears of rent ; the sheep farmers, introducing Black-faced sheep from the mainland, provided a higher and surer return. The commons were required for grazing, the croft lands for wintering and for fodder crops. Fig. 1 illustrates that every crofter in West Harris was evicted from his home ; some emigrated, but most crossed to the ' Bays ' to make crofts where the summer sheilings and kelp dwellings were sited. The Atlantic shores remained in farms for periods from sixty to one hundred years, till the farms were broken up and resettled by people from the overcrowded ' Bays,' descendants of the evicted tenants.

The foregoing historical sketch gives in outline the main influences in the formation of the present cultural landscape.[7] The greatest changes of all have, however, taken place in the past fifty years, when the Hebrides in general began to be influenced by modern trends. The change-over ' from black-house to white ' provides an index of change.

Settlement.—The settlement pattern is explained by historical and

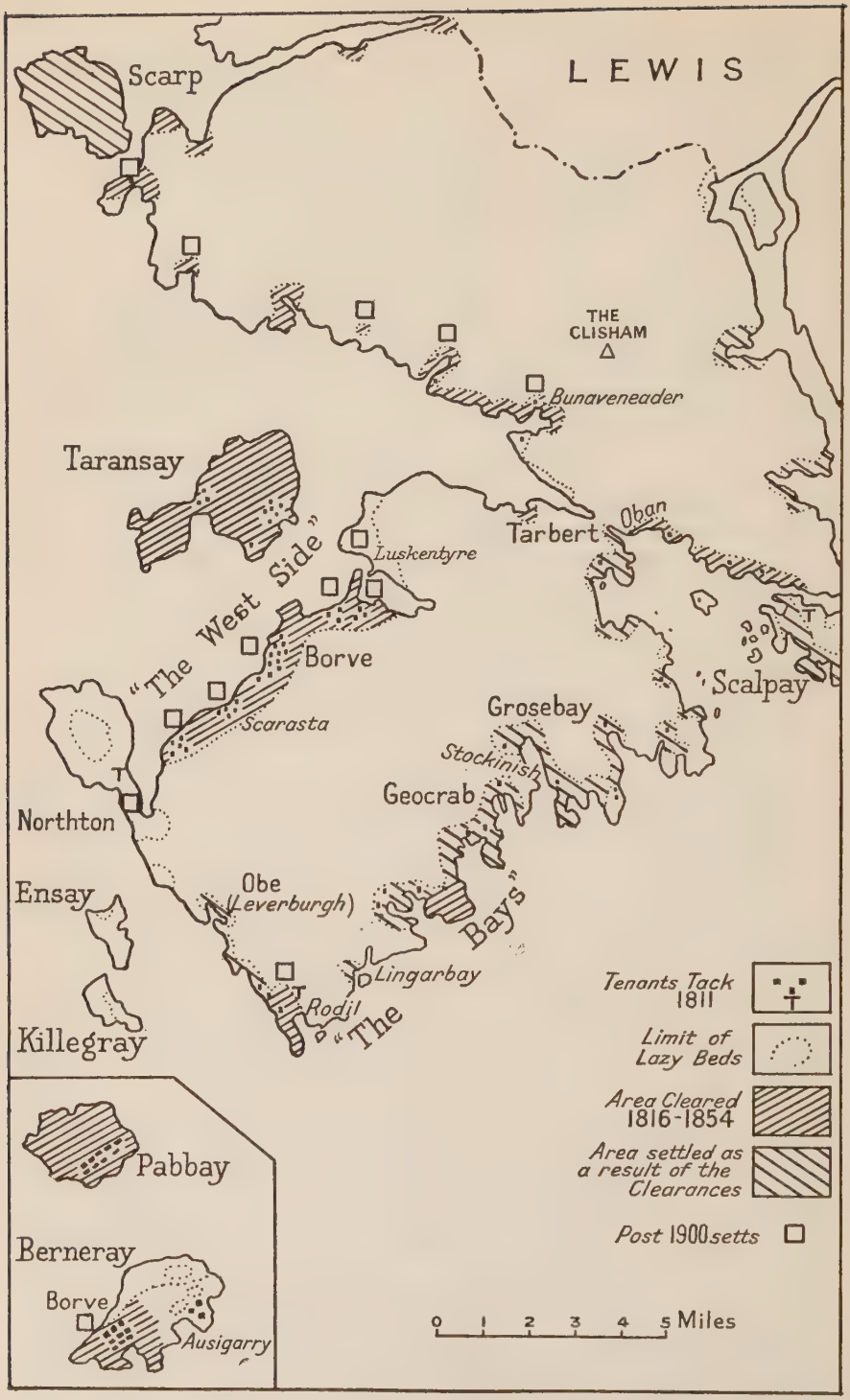

Fig. 1. Harris. Recent history of settlement.

physical factors. The unit of settlement is the croft—a system handed down from feudal times when the chief made a grant of land in return for services. Only since the security of tenure established by the Crofters' Act of 1884 has improvement been feasible. The present crofts, with very few exceptions too small for a complete living, provide cheap homes, milk, butter, eggs, and a small cash return from stock rearing and subsidies. If the croft system is flexible in permitting secondary work, it is wasteful of time and energy, one man taking two calves to a field or going to the hill to ' look ' twenty-five sheep. The individual holdings are grouped in townships, the crofters sharing the land and common grazing. The origin of the township seems to have been the desire of friends to live together in a *baile*, co-operating in the team-work of cultivating, fishing, securing peats for fulling the cloth from the looms. After 1820, individual tenure replaced these ' little commonwealths.'

' *The Bays* ' : *Grosebay*.—In settlement, too, east and west contrast. In the ' Bays ' the lack of level ground and the distribution of rock outcrops make the street township of the Atlantic shores impracticable. The earliest settlement originated about 1780 as an overflow from the west. These crofts were soon overcrowded by the forced migrations from the Atlantic side : even to-day among the settlements clustered round the sheltered inlets there is often more than one house on the croft. The following table gives an idea of the growth of population, a growth which went on without a parallel increase of resources :—

Families in Townships

	Report of Crofters' Commission, 1884			*Personal Observation*
	1810	1850	1884	1949
Geocrab .	8	12	26	18
Scarp * .	—	8	40	14
Scalpay .	—	40	100	120
Grosebay .	1	2	19	12

* All the North Harris townships should be classed with the ' Bays,' conditions being exactly the same. But in West North Harris all the setts are post-1900, except on Scarp (see Fig. 1) which is therefore included as being quite typical of the ' Bays.'

In 1884, the total number of families was 900, of these 620 being landless cottars. The congestion was to some extent relieved by the post-1900 settlements on the ' West Side,' but cottars still make up 20 per cent. of the population of the ' Bays.' The vital density of population on the improved land, only one-third of which is cultivated, is often as high as one person per acre.

Most townships have a post office, general store, school and mission house. Although most are served daily by motor-'bus, the isolation and lack of employment for the cottars has led to depopulation—which is not to be deplored, as the ' Bays ' are much over-populated by modern standards of living as against possibilities of making a livelihood.

Grosebay township, five miles due south of Tarbert, can be con-

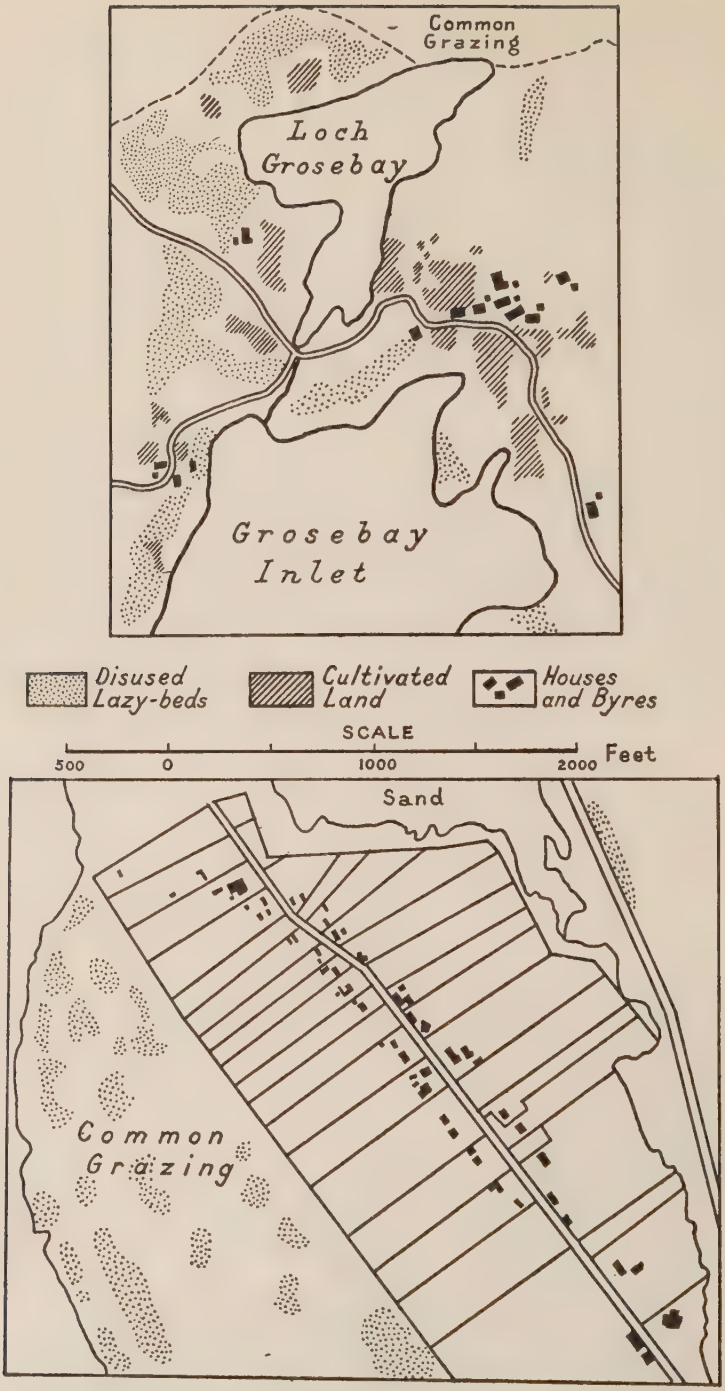

Fig. 2. Grosebay, and Northton. Settlement patterns.

RUSIGARRY, BERNERAY

A fishing community close to the sea. In the foreground, old lazy-beds on the highest point of the island—241 feet. The hills of South Harris form the background.

CROFT AT NORTHTON, HARRIS

Foreground : Meadow hay cut later than the sown hay of the right middle distance, and cabbages for the home. Left middle distance : bere. The two-storey house, built of stones taken from the croft, and the barn-byre adjoin the access road to the township.

TARBERT,
HARRIS

sidered as a typical ' Bays ' settlement. A considerable cliff separates the crofts from the sea ; behind the township the mammillated topography consists of bare or heather-covered rocky knolls interspersed with peaty lochans and peat-filled hollows ; the whole aspect, predominantly grey, stretches gently towards the foot of the rugged hills in the centre of the island.

The first recorded settlement at Grosebay is given in a rent-roll of 1811 : eight sub-tenants, each occupying ' a farthing's land.' The peaceful scene, with land enough for the standards of the time, was soon to be transformed by the evicted tenants of the Atlantic coast, and, by 1884, in spite of emigration from the township, eighteen families shared the land originally portioned among eight. Fig. 2 illustrates the extent of the lazy-beds cultivated at a time when all available land was worked. Such was the population pressure that even land where peat was earlier secured was under cultivation. Only one-third of the lazy-beds are now worked.

There are eight crofts in Grosebay, each cultivating the ' nominal ' five acres ; the oats and meadow hay grown keep the two cows in winter ; sixty sheep subsist on the common pasture. The supplementary industry is weaving, this particular township having six looms. Work on the road now under construction to link the various ' Bays ' townships is at present replacing the tweed industry. Fishing does not occupy a place of importance in this particular township ; only one boat fishes lobsters.

An analysis of the population shows that 56 are at home : 14 work on the mainland : 4 are at sea : and 21 married away from the island. Thus 41 per cent. of the potential population are away from home, an indication of the inability of the township to support its full population. Of the age structure, 35 per cent. are under 15 years of age, and 20 per cent. over 60. Of the 12 families in the township there are 8 crofters, 3 cottars, at present employed on the road, and the Church of Scotland missionary. Only one thatched house remains, several ruined ones are now used as byres. The change from " black into white " was accomplished in the 1930's.

The West Coast : Northton.—The Atlantic coast was the traditional home of the Harrismen till the evictions. Since 1900, land-settlement schemes have restored the best land to the crofters. The smoother topography lends itself to continuous cultivation and a more nucleated settlement pattern (Fig. 2). In Northton and Borve Berneray, both laid out as street townships in 1900, the crofts run at right angles to the road. Elsewhere the houses are sited in groups of five to ten on the slopes above the sea, and generally along the road with the crofts running down towards the shore.

Northton has the finest crofting village site in Harris.[8] The population numbers 133, 17 per cent. of whom are under 15, 23 per cent. over 65. Only 12 per cent. of the potential population are away from home : life is easier there than in Grosebay. Yet the number of young people is steadily declining, due to lack of employment and room to croft. Many of the men who married mainland girls during the war prefer to seek employment away from the island.

The five-acre crofts and low souming of 35 sheep make a livelihood difficult. In order to have the 10 acres arable and grazing for 100 sheep, recommended for full subsistence by the Crofters' Commission in 1884, the holdings would have to be reduced from 36 to 14.

Tarbert and Leverburgh.—Tarbert and Leverburgh, with Northton, are the only fair-sized settlements in Harris. At Tarbert, Macbrayne's mail and passenger steamer *Lochmor* calls three times a week bringing the 'ubiquitous' Beattie's bread, and all other supplies, from the mainland. Tarbert acts as the distribution centre for the island : the most surprising feature of this village of 400 inhabitants is the establishment of seventeen 'general merchants,' most of them dealing in rationed goods! There is a housing problem, mainly overcrowding, but also the replacement of poorer houses ; 28 Swedish timber houses have just been completed. They are to be occupied by people from Tarbert and from the 'Bays' townships—the latter the nearest manifestation of 'urban drift' in the island.

Leverburgh, with about 200 inhabitants, was developed by Lord Leverhulme in his attempt to found a 'second Aberdeen,' with large curing sheds and boats working out as far as St. Kilda. After this philanthropist's death all work ceased and the village is now largely residential and favoured by Harris exiles retiring from the mainland.

Housing.—A stranger to the Hebrides often expects the thatched or 'black' house as the predominant type of dwelling, and in certain remoter parts of neighbouring Lewis such is the case. In the 'Bays' district of Harris thatched houses number about two to every nine 'white' or non-thatched houses. The traditional 'black house,' with central fire and a partition separating the animals and the people, ceased to exist in Harris forty years ago. The more modern thatched houses have squared-off walls and gable-chimneys, more often than not have modern ranges, and are extremely comfortable and well-kept. On Berneray and Scalpay good housing is an index of relative prosperity.

Communications.—Most townships are either linked or in the process of being linked by road. Motor-'bus services run to Tarbert on boat-days and to Stornoway twice daily, and are the main form of transport for passengers and an amazing variety of goods which range from mail and newspapers to calves and hardware. Sea communications are of vital importance, as the days of a self-supporting economy are long past. The daily Kyle-Stornoway service is linked by a service 'bus to Rodil ; the *Lochmor* calls at Tarbert, Stockinish, Scalpay and Rodil on Tuesdays, Wednesdays and Fridays.

Population Changes and Trends.—The population trend of Harris differs from that of mainland parishes of the north west by its late 1911 peak. The over-all population density of the island is low, but the vital density of population to improved land is approximately 500 per square mile. Tweed and fishing have kept the decline down to 23 per cent. since 1911.

After Dr Webster's Enumeration of 1755 the population rose steadily, the profitable kelp industry making it desirable for sons to stay on the croft. After the collapse of this industry the rate of increase was slowed by emigration consequent upon the evictions. The emigration

reached a peak after three successive bad agricultural years, 1849-51. The misery of this period was such that 60 per cent. of the island's population were being maintained by parish relief in 1851. The success of the tweed industry and the new settlements allowed increases to be maintained till 1911.

Since the failure of the Leverhulme schemes in 1925, lack of work has forced many families to leave the island for Bracadale in Skye,

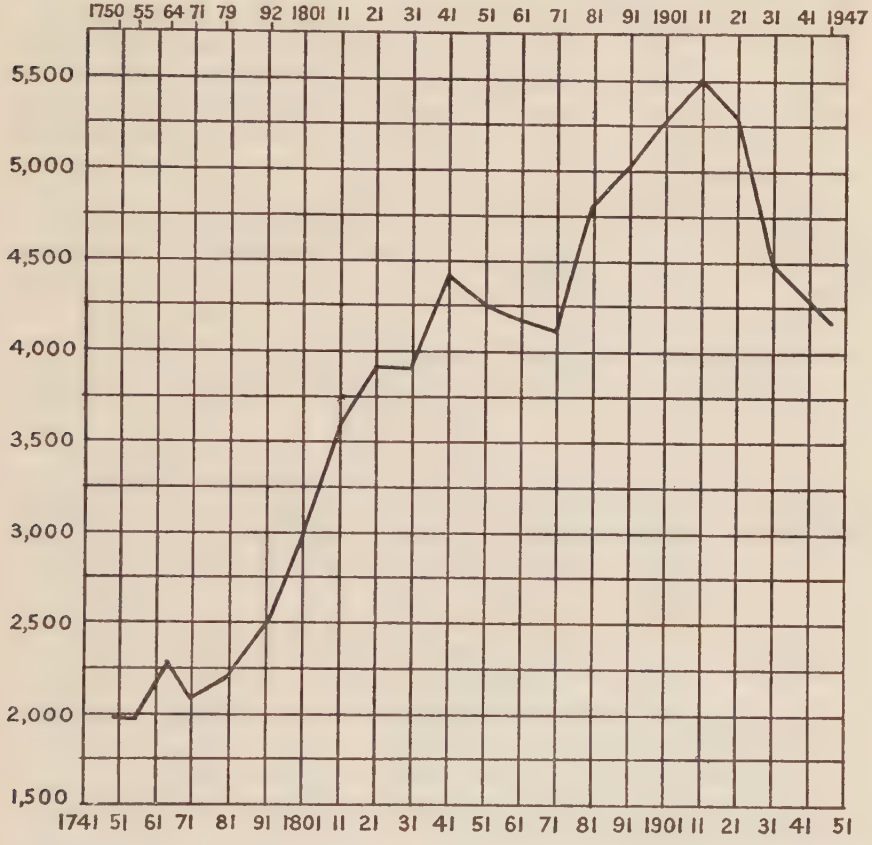

Fig. 3. Population of Harris, 1750-1947. Data for the eighteenth century taken from *An Economical History of the Hebrides*, by John Walker, D.D., 1808, Vol. i, pp. 23-24 ; for 1801-1931, from the Census Returns ; and for 1947, from *Recent Fluctuations in the Populations of Parishes in the West Highlands and Islands*, by R. S. Barclay and F. F. Darling, 1948.

Glasgow and overseas. There is now an annual temporary migration : the men to salmon fishing on the Tay, or constructional schemes on the mainland ; the young women to hotels. Most young men leaving Harris go into the Merchant Service or seek employment on the mainland. The present decline in population, due to the lack of employment and to pressure on the land, will continue. It may be arrested by constructional works in Harris : road and water schemes ; but thereafter the population will further decline as this primitive agri-

cultural community on the fringe of industrial Britain finds it increasingly difficult to compete with the rising cost of processed articles necessary for existence. Only a strong, tax-free tweed industry, a more intensive form of cultivation treating the croft more as a garden, and, where possible, larger holdings, will make a reasonable living practicable and arrest the drain of population.

Certain aspects of social conditions are in need of improvement, but their execution is by no means simple. The paramount need is the provision of running water which would greatly ameliorate the hardships of island life. The community spirit, once so strong in the *baile*, under present conditions suffers from the lack of social and recreational facilities : only at Tarbert and Leverburgh are there village halls. Rural development, unless heavily subsidised, is hampered by lack of public funds.

These conditions and problems of social economy in the Isle of Harris are to be regarded as the regional application to one island of what is generally known as " The Highland Problem " : the close relationship of environment and people makes its essentially geographical nature quite apparent.

* Strictly speaking, Harris is the southernmost parish of the island of Lewis-and-Harris. The *Isle* of Harris is a living title backed by tradition, and expresses a separate geographical, historical, economic, and cultural entity.

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View of Tarbert, by courtesy of the Air Ministry, Crown Copyright reserved. Photographs of Northton and Rusigarry by the author.

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EARLY SCOTTISH CARTOGRAPHERS

By John Bartholomew

Scotland on the map has one of the most distinctive outlines of any land. Angular in shape, she may be said to be rugged and individualistic like her inhabitants. But, not always has she been pictured on these lines. In the Middle Ages we find her shown as a dumpy and somewhat shapeless mass. Travel was difficult and dangerous in those days, and the maps of Matthew Paris, that in Hereford Cathedral and others, were monastic compilations, based largely on hearsay information. These were copied and passed on from monastery to monastery, a process in course of which it is not surprising that mistakes occurred. Hadrian's Wall, for instance, is not infrequently misinterpreted as a broad canal of water separating the two kingdoms.

The maps of Ptolemy dating from the second century A.D. are based on the monumental work of that great Alexandrian geographer. Their introduction to Western Europe at the time of the Renaissance represents a curious episode in the great revival of classical learning. These maps, first engraved and printed towards the end of the fifteenth century, were sent out from the presses of Italy and Germany in numerous editions and helped to whet the general appetite for geographical knowledge. Although less accurate than the contemporary Portolan Charts of Venetian and Portuguese mariners, they were held in high veneration by scholastic circles for nearly 100 years. Indeed, as in the case of the newly found and disseminated Scriptures, it was almost a heresy to call their accuracy in question. The problem of why Scotland is twisted eastwards through such an unnatural angle has been explained by T. G. Rylands and other authorities as being probably due to the misorientation of one of the rough sailing sketches from which Ptolemy built up his data. Such a mistake can be readily understood, for it has recurred in other and more enlightened times.

An event of supreme importance in the improved mapping of Scotland took place in the summer of the year 1540 when King James V, to get a knowledge of his kingdom, made a voyage round the full extent of its shores. The project was planned and successfully carried out under the direction of the King's Pilot, Alexander Lyndsay, a well-trusted Scottish seaman and expert hydrographer. The original records of this enterprise along with Lyndsay's map have unfortunately disappeared. It is to a foreign source, therefore, that we have to turn for such details as are known. In 1583 the French geographer Nicolay d'Arfeville published in Paris the book "La Navigation du Roi d'Escosse Jaques Cinquiesme du Nom autour de son Royaume et Isles Hebrides et Orchades soubz la conduicte d'Alexandre Lyndsay excellent pilote escossois." This book contains the carefully engraved map, reproduced in the R.S.G.S. *Early Maps of Scotland*, along with details of the voyage and the following account of how it came into d'Arfeville's possession.

In 1546 Lord Dudley, Admiral of England, went to France to sign a peace treaty on behalf of his master Henry VIII. There he met d'Arfeville, and, recognising his skill in matters hydrographic, invited him to visit England as his guest. On arrival in the latter country and

in exchange for certain of his own navigational works, d'Arfeville received " Un petit livret escrit à la main en langage Escossois contenant la navigation du Roi Jaques V . . . ensemble la carte marine assez grossement faict."

The voyage is divided into four parts. *First*: Lyth to Humbre *via* Saincte Ebbes, Staples, Bambourg and Flambourg. *Second:* Lyth to Dungesby en Cathness *via* Kyngorn, Sainct Andre, Montroz, Aberdyn, Buquhannesse and Inuernesse. *Third:* Dungesby to Mule de Kinteir *via* Chethlande, C. Wraith, Gairlogh, Kylark, Ardemurthe, Comkill, Collansa, Yla and Dura. *Fourth:* Mule de Kinteir to Soluay *via* Sanday, Arren, Buit, Dumbretton, Aire, Lac Reyan, Quhytirne, Crey and Karlylle.

There can be no doubt that this royal voyage, along with the information gathered by Alexander Lyndsay, was responsible for the greatly improved mapping of the country, which became generally current shortly afterwards. This may be seen in the maps of Lily (1556), Sebastian Ré (1558), and Mercator (1564).

Nicolay relates how on his return to France he had this little book translated with the assistance of Maistre Jehan Ferrier, a learned Scot at that time resident in Paris. It was then presented to the French King, but not printed and published until some thirty-seven years later, when it appeared with dedication to the Duc de Joyeuse, Admiral of France. The author also mentions how he took part in a military expedition to Scotland when siege was laid to the Castle of St Andrews after the murder of its Archbishop by the so-called rebels.

While the coastline had now been reasonably established, it must be remembered that the interior of the country, and particularly the Highlands, remained an area almost unknown and uncharted. It was towards the end of the same century that a man appeared, unhonoured in his lifetime, who deserves to be recognised as Scotland's pioneer cartographer. Timothy Pont was born about the year 1562, elder son of the Rev. Robert Pont, a well-known leader of the Reformed Presbyterian Church, three times Moderator of its Assembly, and at the same time a Lord of the Court of Session. In 1580 Timothy matriculated as a student of St Leonards College, St Andrews, where he held a scholarship and graduated M.A. in 1584. In 1601 he was appointed minister to the remote northern parish of Dunnet in Caithness. Of the intervening seven years before this appointment there is no record, but as one of his maps, covering Clydesdale, bears the date 1596, it can be assumed that his self-imposed task of surveying the country was well in hand by that date.

How he carried out his extensive wanderings through the country is a mystery to-day. The Highlands were in a disturbed and lawless state and he had little save his compass and his own stout limbs to aid him in his work. According to Sir Herbert Maxwell, he resigned his ministry at Dunnet some time between the years of 1610 and 1614. Anyway it was about the latter date or soon afterwards that death overtook him. That untimely event and the lack of competent executors nearly led to the loss of his papers. In 1617, however, King James VI got word of the affair on one of his return visits to Edin-

burgh and had them purchased for the nation. Thereafter they lay neglected for a quarter of a century until found by Sir John Scot, Baron of Scottis-Tavert, Director of the Royal Chancellery. He sent them in 1642 to Robert Gordon of Straloch (1580-1661) who was already familiar with Pont's work. This eminent Scottish geographer along with his son James Gordon, minister of Rothiemay, then revised the drawings for press so that Sir John Scot was able to take them personally to the Blaeus in Amsterdam to have them engraved and published.

The best account of Pont's work is contained in a letter, dated 24th January 1648, from Robert Gordon addressed to Sir John Scot, which is reprinted in the Atlas. Amongst other things he writes as follows : " Now at length after many labours, after the loss of much time and after such troubles as the mind shudders to remember, our Scotland is worthily admitted to her place in the great and famous Atlas of Joannes Blaeu. She is not delineated from hear-say, as has so often been the case, but from the papers left by Timothy Pont, a man of great talent, who started this work and left it to us in his writings. His memory cannot be forgotten without the basest ingratitude. For, with small means and without a patron to assist him, he completed his task some 40 years ago. He travelled on foot through the length and breadth of this Kingdom, a thing which no one before him had done. He visited all the islands inhabited for the most part by people hostile and savage and with a language differing from our own. He had often been stripped and robbed, he has told me, by cruel and wild men while suffering the never-ending perils and hardships of the road. Never at any time, however, did he give up his task, nor did he lose courage. On returning home to publish the results of his work he was frustrated by the meanness of printers and booksellers who would not advance the necessary funds. Thus while awaiting happier fortune, untimely death took him in his prime."

In the *Dictionary of National Biography* Pont's death is given as occurring between 1625 and 1630. This does not, however, fit in with the above letter, nor is it accepted by Sir Herbert Maxwell in his fine account of the cartographer.

The maps were duly engraved in Holland under the personal supervision of Sir John Scot and finally published in Blaeu's *Nieuwe Atlas* of 1654, and later, with slight additions, in his *Atlas Major* of 1662. The plates of both of these atlases exhibit certain mistakes which illustrate the difficulty of making such a compilation when cartography was still in its infancy. The plate of Arran is oriented correctly in Pont's drawing with East at the top, but the editor has inserted " Part of Kyntyr " on the left-hand or northern side as if it were in the West. This in turn has led to the amusing mistake in the general map of Scotland of showing the island of Arran oriented East and West instead of North and South. The map of Bute shows the same error with Kyntyr appearing North-West of the island. Pont's original drawings along with an interesting collection of maps by Gordon of Straloch are now preserved in the National Library of Scotland.

In the year 1682 Sir Robert Sibbald, a man of considerable scientific

ability, was appointed Geographer Royal for Scotland. His ambition was to publish a better Scottish Atlas than that of Blaeu, and, to that end, he engaged John Adair, a young Edinburgh surveyor, to draw maps of the counties. Adair, who was probably born about 1650, drew a specimen map of Clackmannanshire and later completed at least ten other county maps. The atlas scheme seems to have failed, however, for lack of public support. Adair, moreover, appears to have had difficulty in completing his maps for publication and was frequently in dispute with the Treasury over payment. Three plates —Clackmannan, Forth, and Strathearn—were engraved during his lifetime, a further four were engraved by Richard Cooper after his death. Adair also started work on a sea atlas of the coast of Scotland of which only the first part was published in 1703. Its outline is rather devoid of detail, but the section printed includes a copy of d'Arfeville's map of 1583. One reason for its comparative failure was the success achieved by Captain Greville Collins in his *Coasting Pilot* of 1693, a superior publication in every way, which had been started under the patronage of Charles II seven years earlier. Adair died in 1719, his papers being taken over by the Treasury.

During the eighteenth century, many skilled hands came forward to minister to the cartography of Scotland. John Elphinstone, Captain in the King's Engineers and eldest son of Lord Elphinstone, completed an admirable map of the country in 1745 which was much used in the ensuing fighting. He also produced an excellent map of the Lothians (1743) and one of Great Britain (1733). Captain Elphinstone died in 1753 before succeeding to the title.

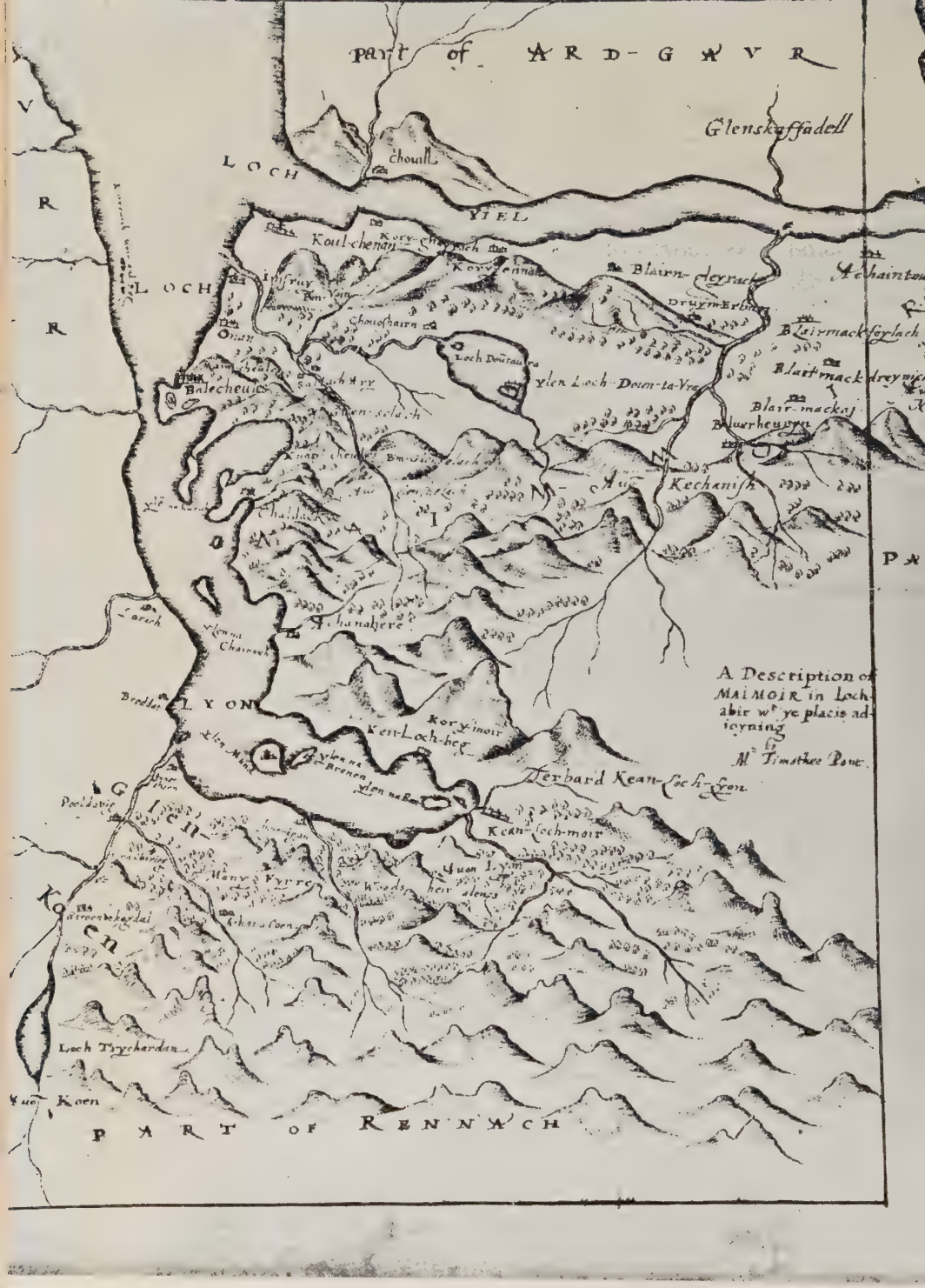
Another notable mapmaker was John Ainslie (1772-1813). A surveyor and native of Edinburgh, his best-known works were "A Plan of the City of Edinburgh" (1780) and an excellent map of Scotland in nine sheets on the scale of quarter-inch to the mile published in 1784. The latter was certainly an improvement on anything which had appeared before. He also issued maps of several Scottish counties along with a treatise on the Art of Surveying.

Although much suffering resulted from the Jacobite Risings, their consequences were not without benefit to the community at large. An excellent series of roads was started by General Roye and a military survey instituted by the Duke of Cumberland was carried out under General Watson. This survey took many years to complete, but for one reason or another was never officially published. Lodged for a considerable time in Windsor Castle, it is now in the King's Library at the British Museum. It is important to note, however, that permission was granted to Aaron Arrowsmith to base his famous map of Scotland upon it on the scale of four miles to the inch. Published in 1807, it thus comes about that Arrowsmith's map, with its interesting memoir, was the first to show a really accurate and detailed outline of the whole country. The Military Survey, although not generally available in its completed form, is in fact the predecessor and commencement of our present-day Ordnance Survey.

Acknowledgment is due to the Trustees of the National Library of Scotland, for permission to reproduce a portion of the Pont MSS. Also to Mr D. Alan Stevenson, for the loan of material referring to d'Arfeville's account of King James V's voyage.

MERCATOR, 1564

Map of Scotland, reduced from the Breslau copy of Gerard Mercator's engraved map of the British Isles in 8 sheets. It incorporates not only the results of James V's voyage, but also topographic details not previously published. As the finest and most accurate map of its day it was copied by Ortelius for his Atlas in 1573 and by various other map makers.



TIMOTHY PONT

S. map of Mamore, slightly reduced in scale and bearing the author's signature. West is situated a
) of drawing. Among names to be noted are: Loch Lyon (Loch Leven), Balecheules (Ballachulish), and
Glen Koen (Glencoe).

PENTLAND HILLS

ALLERMUIR CAERKETTON, BOGHALL BURN

(Photo. 5320. overlapping [illegible]302)

PENTLAND HILLS

WOODHOUSELEE

(Photo 7302, overlapping (N) 5320)

VEGETATION AND AGRICULTURAL ACTIVITIES AS SHOWN BY AERIAL PHOTOGRAPHS

By E. Wyllie Fenton

The preparation of maps is not always easy particularly on uneven ground. In vegetation the groups of plants which usually play a dominant or sub-dominant part in determining the general vegetation cover show different shades of green, which are usually easy to distinguish even at some distance. Green is not the only colour present in vegetation, for red tints are by no means rare and occasionally brown may be present, while in autumn many colours are present usually in varying depths of shade. Until aerial photography is done in colour, such visual aids will not be available. Hence, for the most part, one must rely on depth of shade—white to black—as the key by which to interpret the nature of the vegetation. Another important item is whether the photoprint is light or dark. This may improve or make more difficult the identification of certain features.

Marks left on the surface of the land as a result of man's activities may take varying forms, such as the typical ridge and furrow, drainage ditches, walls, enclosures, sheep and other tracks. It is often not only difficult but sometimes impossible to detect these surface irregularities if old and covered by dense vegetation. The detection of these is most often accomplished when the sun is low and shining at an oblique angle across the surface of the ground. At certain angles it is very easy to detect ridge and furrow which under other conditions might never be noticed. Fortunately aerial photography is particularly good at showing up most of these surface changes caused by man. It is, therefore, proposed in this paper to make a detailed examination of two aerial photographs, in order to demonstrate their value as an aid to mapping vegetation and former agricultural activities in upland areas in Scotland. The photographs selected each cover about one-and-a-half square miles of hill ground over adjacent areas at the north-eastern end of the Pentland Hills, south of Edinburgh.

Photo. 5320.—In the north-east corner, the well-known "T-Wood" lying just east of Swanston Village shows up like the shadow of an aeroplane, while the dark, irregular mass projecting almost half-way across the middle of the photograph from the eastern edge is Caerketton Hill (1550 feet). Caerketton, which is visible from most parts of Edinburgh, is part of the extreme northern outlier of the Pentland Hills, and from it a fine panorama of Edinburgh, the Forth estuary and the southern parts of Fife can be seen. The Swanston march wall and fence, with various footpaths and tracks, show up well in the deep shade of heather near the top, with the northern-facing screes below. From Caerketton the march zigzags westwards along the local watershed to the top of Allermuir (1617 feet) where another line of fencing, running from north to south near the western edge of the photograph, meets it and momentarily turns westward with it before continuing

south. It is to Boghall Glen, the area south of the Swanston march, that most attention will be paid in this paper. Boghall Burn rises approximately between the bases of Caerketton and Allermuir and flows southwards towards the boundary fence, then turns sharply eastwards parallel with the Woodhouselee boundary fence.

Just below the top of Caerketton, Caerketton Cleuch shows a lighter colour where bracken is the dominant plant, and a line indicating a sheep track can be seen traversing it at right angles to the remnants of an old fence. To the west of this and a little lower, a small dark triangle is seen, with a square fence surrounding it. This is a small artificial dam on Boghall Burn. Immediately to the east of this is an improved area of grassland laid down after the outbreak of the last war. This is the site of former cultivations, perhaps two hundred years old, interesting in that the old ridges and furrows still persist. It is noticeable that at the lower part the ridges and furrows swing to the left as they descend to the base, a not infrequent feature of some of these old cultivations ; the old marks also run perceptibly higher up the hill than the recent cultivations. It is interesting that the new grassland is darker in colour than that on the other or west side of the Boghall Burn, since the dominant grass there is *Nardus*. The reason for the different depth of shade is a question of absorption or reflection of light, due to the condition of the vegetation at the time the photograph was taken. Slightly north of this and on the western side of Boghall Burn another area showing traces of ridge and furrow can be detected. This is a more fertile hollow in the lower reaches of the eastern part of Allermuir. The grass is not *Nardus*, as one can detect from the slightly darker shade of colour. Just below the sharp west turn of the boundary fence at the top of Allermuir a rather medium depth of shade is noticeable just south and turning to the east. There the vegetation is dominated by blaeberry (*Vaccinium myrtillus*). Similar areas can be noted south of Caerketton.

On the eastern side of Boghall Burn just before it turns sharply east when approaching the wall dividing Boghall from Woodhouselee, another patch of improved grassland is evident. Near the top a vague circle is seen which represents water from a spring meandering downhill, for it is a ditch lined with rushes, showing up darker than the grassland. Here also there are traces of old ridge and furrow.

Immediately east or to the right, is seen a fenced part with, at the top, a dark and light mark. This mark is a hay-stack with its dark shadow, which stood at this part some years ago when the photographs were taken. The colour of this area is lighter than the two improved parts because at the time much of the grass was rye grass, which at the stage of growth it had reached tended to reflect light. The slightly darker marks are due to the presence of rushes. A little above this area can be seen an oblong and a square area, which represent two experimental plots. East from the base of this former hay enclosure can be seen an oblong area running almost east and west. It has been altered by ploughing in the centre some years ago, but, ignoring this, the rest of the outline is reasonably clear. According to my predecessor, the late Dr W. G. Smith, this part was known as " the gardens ";

the outer and dividing marks are the remains of old turf walls. Either this represents an old enclosure used to keep stock out, or a place wherein stock could be confined. So far we have no record or information as to which of these purposes it may have served in its day.

If we now move to the north and a little to the east, roughly east and slightly north of the hay-stack, three sides of a square area are shown by a turf wall. Whether this was for enclosing stock or keeping them out is an unanswered question. But it is highly probable that long ago some form of transhumance was practised in Boghall Glen. The small dark dots within the remains of the turf walls, and also without, are whin bushes (*Ulex europaeus*). Passing still to the east and approaching the west side of the Leips Burn, more marks are evident running almost parallel with the stream; some of these are ridge and furrow. Following the line of the small valley downwards towards the cultivated field, where the track leads from the Boghall Farm to the upper part of the glen, the irregular outline of drainage ditches can be seen. The field (fenced) is of great interest, as it is the arable land of the old Leips Farm which flourished long before Boghall Farm came into existence. Boghall only became possible after the draining of the marshy land in the plain below the Pentland Hills which stretches across to Roslin. There is no longer any sign of the site of the farm house which occupied a position just about the top of the field. It disappeared some years before Napoleon came to power, came back during the Napoleonic war, and after that disappeared for ever. The land was broken up in 1939 and has been under cultivation ever since. Traces of the old enclosing wall still exist running west from Leips Burn round the north side and down the west side of the field to Boghall Burn. Very few traces of it can be seen on the northern side.

Photo. 7302.—The photograph is traversed from west to east along its northern edge by the Woodhouselee march with Boghall, an obvious overlap with the southern edge of *Photo.* 5320. Just south of this line of fencing lies Fala Knowe (1434 feet), between the Colinton-Castlelaw path which runs SSE from the north-west corner and a dyke which takes off SSW from the middle of the march boundary fence. Woodhouselee Hill (1250 feet), which continues the ridge of Fala Knowe eastwards, lies between this minor dyke and the line of trees enclosing the arable parks in the eastern half of the photograph. Woodhouselee Glen to the south of the ridge is an area of considerable interest as it shows the result of many former activities of man.

We therefore now pass to consider a few items in the Woodhouselee Estate south of Boghall Burn.

First it will be noticed that the line of the dividing wall at the western boundary of Boghall Glen shows heather on the Woodhouselee side but not on the Boghall side. This is largely due to more intensive grazing over a long period. The track which leads from Colinton can be traced running from the west, south-east by south, round the south contour of Castlelaw. This is possibly an old drove road. Following the boundary wall between Boghall and Woodhouselee from the west towards the east, it will be noted that the vegetation is grass and not

heather, till a dividing wall is passed half-way towards the east. The reason for this is good water supply and more intensive grazing and dunging by sheep. The dark dots are juniper bushes. A noticeable feature as one moves south is the distinct change in colour, so that there are areas not so dark as at a higher elevation. These lighter areas are where heather has been burned and it has not completely recovered. The well-marked long, narrow strip has not much heather but contains much blaeberry as well as mosses. On the western side of this strip there are still some traces of ridge and furrow, but the vegetation rather conceals its presence. Going east after passing the dividing wall running south-west is a dark patch with heather. The reason for this is that there has been a downward wash of peat waste from higher up the hill and this has settled near the wall. As one moves east, there are lighter patches of vegetation which contain much bracken.

Just a little south-west of the north-western edge of the trees surrounding the fields two features are very noticeable. First, a somewhat oval line enclosing the top of Woodhouselee Hill. This marks the traces of an old stone-and-turf wall or dyke. Second, at the north-eastern part of this oval, ridge and furrow move downhill towards the north-east. We have been told that well over a hundred years ago this area grew a crop of turnips. The turf-and-stone wall or dyke must therefore have been an enclosure for stock, assuming that some form of transhumance was practised. Examining next the south-west corner lying outside the enclosed area, there are the familiar ridge and furrow lines again showing a curve towards the left, if ploughed downhill. Immediately west of this there are ample evidences of ridge and furrow both north and south as well as roughly west and east. Moreover, there are still traces of ridge and furrow just west of the well-marked north and south ridges lying west of the wall. Immediately south of the oval enclosure there are many dark dots due to the presence of whin bushes.

Just to the south-west of the western lower patch of woodland may be seen further traces of ridge and furrow. One part in particular runs over the top of a low hill and separates two patches of heather. This is the most surprising of all these marks, for both the position and slope are so peculiar that to achieve this result must have been an athletic feat.

Drainage ditches of the present and less recent times are easily distinguished. These for the most part show rather peculiar patterns and sometimes are superimposed on old drainage channels as well as ridge and furrow. They occur both in Boghall Glen as well as Woodhouselee Glen. The varying depths of shade in the darker parts indicate heather, old, young and in varying stages of recovery or retrogression to blaeberry, or grasses including *Nardus*. Perhaps the only other obvious marks that catch the eye are the small ' bomb ' holes caused by military activities during the last war. These are seen within one of the wooded parts just below the centre of the photo and west by south of the buildings seen on the east side of the photo. The marks in the south-west corner of the photo are due to military activities.

There are several other items, but the present brief outline is sufficient

to indicate the general interpretation of aerial photographs and the use of this method as an aid to mapping.

Perhaps a concrete example of the advantages of aerial photos is the best method of demonstrating their value. A previous article dealing with the vegetation of Boghall Glen [1] required long, arduous spells of work over several years and at different times of each year. Even surveying the valley from the surrounding hills, although helpful, gave a rather one-sided or distorted picture. It was only when the sun was shining at very low angles that some of the ridges, furrows and variation in ground level became obvious. Frequent changes in elevation created difficulties. An aerial photo gives a true picture of these and other items. This greatly reduces the work involved and enables a more detailed examination to proceed without much preparatory work.

In more remote areas the advantages of aerial photos need no stressing, as the saving of time and energy has to be experienced to be fully realised. The contour of hills and slopes, the course of streams, the presence or absence of trees are all clearly shown.

It can be extremely useful for forestry, and with practice and experience it may be possible to estimate the nature of woods and probably some of the species forming the wood. Such photos also give information regarding the nature of the exposure of certain slopes, which often affects plant growth.

Other useful information can be found which indicates the nature of water-catchment areas and the siting of reservoirs. In the construction of new roads various advantages or disadvantages can be seen from a study of the aerial photograph.

The points outlined do not remove the necessity for ground surveys in spite of the many advantages of aerial photos—they do not reveal such vital information as the depth and the type of the soil. Areas covered with heather or even grasses are not all similar. Only a ground survey reveals plants of secondary or lesser importance in the vegetation, and the presence or absence of such plants often provides valuable information for agriculture and forestry. The ground survey also provides essential information concerning animal life which may be a matter of importance. Thus the aerial photo not only gives a true picture of the terrain but, to the experienced eye, frequently indicates where a detailed examination of the ground vegetation will be necessary.

[1] *S.G.M.*, 1933, 49 (*6*), 331-354.

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THE FORESTS AND FORESTRY OF SCOTLAND

By H. M. Steven

The Natural Environment

The forests of a country are a result of the interaction between its climate and soils and the activities of its people, destructive and constructive, in the past and the present. Let us consider first how the physical features of Scotland influence its forests and forestry.

Its geographical location has given Scotland a cool, humid *climate*, very oceanic in the west and less so in the east and especially in the eastern Highlands. There is a steep gradient in rainfall from east to west and with altitude. The regional variations in temperature are much less, except in relation to altitude. Exposure to the prevailing westerly winds depresses the altitudinal limits of woodland compared with comparable continental locations ; even in the eastern Highlands, in the lee of the highest hills, the tree limit only reaches 2000 feet exceptionally, and in the west may fall under 1000 feet above sea-level.

Such a climate tends to develop *two natural soil groups*, Podsolic and Peat Soils. Brown Forest Soils may be developed on parent material of high base status. Many forest soils and these available for afforestation show podsolisation ; some are freely drained, but many exhibit impeded drainage, due to iron pan or other indurated layers, while gleying is common. Fertility varies widely, from low nutrient levels on maritime sand dunes and podsols from parent material derived from such formations as Dalradian quartzites, through those from granites, to relatively rich soils from Ordovician strata and Dalradian mica-schists. In many instances the parent material is glacial in origin : fluvio-glacial sands and gravels, and till. Topogenous bogs are to be found both in the east and the west, while blanket bog mantles large areas in the west.

Here in Scotland *two natural forest formations* meet [1] : Pinewood and Birchwood, an oceanic outlier without spruce (*Picea abies* L., Karst.) of the Northern Coniferous Forest of Europe, and Oakwood, a variant without beech (*Fagus silvatica* L.) of the Deciduous Summer Green Forest of Western Europe. Remnants of natural pinewood and extensive tracts of natural birch persist in the Highland region both in the east and the west. There are relatively few surviving natural or semi-natural oakwoods, but in the past they clothed the slopes and valleys in the Border country, the central plain, and the coastal lowlands, both in the north-east and in the west, and penetrated far up the river valleys to meet the natural pinewoods, as in places they do to-day, for example at Craigendarroch, Ballater, at 900 feet.[1, 2] The sites of these oakwoods are now largely the agricultural land of Scotland.

Because of geological causes during glacial and post-glacial times,

our indigenous tree flora is poor in species compared with continental Europe, and still more so with some regions of similar climate such as the Pacific coast of north-west America. Further, our climate is not optimum for any of our important native trees. The oaks (*Quercus robur* L., and *Q. petraea* Lablein) are at the northern limit of their natural distribution, and only under the most favourable conditions of climate and soil do they reach the size and quality necessary for high-grade uses. The birchwoods contain both *Betula verrucosa* Ehr. and *B. pubescens* Ehr. with intermediates.[1] They have for long been subject to negatively selective felling and to grazing, and most are poor ; moreover the evidence in Scandinavian countries is that, from a forestry point of view, the birches improve from west to east, and that more continental conditions than Scotland possesses are optimum for the growth of these species. The pine, *Pinus silvestris* L., grows under a very wide range of climatic conditions, from Scotland to the Urals and from Turkey to northern Scandinavia, and its strains are attuned to different climates. Nevertheless, for its best development, it also requires more continental conditions than we possess, except perhaps in the eastern Highlands. It has been suggested that Scots pine needs a certain period of winter frost,[3] but its duration of shoot growth during the summer indicates that it is adapted to a definite, but not long growing period ; in any case not to an oceanic climate.

While nature has thus been niggardly, there are tree species, particularly conifers, belonging to climates similar to our own in different parts of the world, which have been introduced and grow well in Scotland. This explains the present-day pattern of the extensive use of introduced conifers. Moreover, many of our forest soils are fertile compared with those of other countries, and consequently production, if not always quality of timber, is high.

In this country also the forest formations meet another plant formation: the peat bogs or peat moorlands which may entomb forests, but which are treeless to-day unless man intervenes drastically. Again, as in western Europe from Jutland to western France, the heaths cover large areas, and while some are seral to woodland when it is destroyed, they tend to persist as heath particularly under grazing and burning, and their afforestation is not always easy, especially when podsolic soils with indurated layers have developed. The peat bogs and upland heaths cover most of the land most readily available for the extension of our forest area. Their afforestation, or reforestation, is thus a battle with nature.[4, 5]

The Prehistoric Period

In the final phase of the Pleistocene Ice Age, the evidence is that the whole of Scotland was mantled with ice. Hence it is very unlikely that tree species, unless perhaps arctic willows and the dwarf birch, *Betula nana* L., survived in ice-free locations from the last inter-glacial period. Our present tree flora, therefore, immigrated in post-glacial time and via England which was connected to the continent by a land bridge until probably *Atlantic* time, to use the Blytt-Sernander terminology.

The sequence in immigration and variation in forest communities has been studied in Scotland since the end of last century. The pioneer was James Geikie, who investigated the remains of stumps, leaves and fruits in successive horizons of peat-bogs. Lewis [6] continued Geikie's work in the first decade of this century, and after the development of pollen analysis in Scandinavia, Erdtman [7] and others added pollen data to that from macroscopic remains. There has not been the same intensive study in this latter field in Scotland during the past decade or so as in England where Godwin [8] and his associates have greatly extended knowledge, or as in Ireland where the Dane, Knud Jessen,[9] and his Irish collaborators have produced a clear picture of the post-glacial flora in Ireland, but the broad outlines are known.

In pre-Boreal time, probably about 8000 B.C., the improving climate after the retreat of the ice made it possible for tree species of birch to form copses in the tundra-like heaths. The climate continued to improve, and in the succeeding Boreal time the evidence is that it was less oceanic and thus more favourable to the growth of the native tree species than to-day. Thus came the first closed forests, and the dominant species at the beginning of the period were the birches. Geikie and Lewis found no pine remains in the zone called by Geikie *Lower Forestian*, which was later renamed *Boreal* by Scandinavian investigators; but pollen analysis by later investigators showed that pine was present, although less abundant than in the south and east of England and comparable locations on the continent. A curious feature of this period was the abundance of hazel not only in Britain but in western and central Europe generally. It should have had a beneficial effect on the development of the then raw post-glacial soils. During this period also, the oak, elm (*Ulmus*) and alder (*Alnus*) immigrated into Scotland and, at least in the lowland regions of Scotland, there was probably mixed oakwood before the end of this period.

In the succeeding Atlantic time there was an increase in alder, and in the lowlands probably Alder-Oakwood was dominant, and birch was still an important tree with a little pine, while holly (*Ilex*) in our woods may date from this time. In the uplands and in the west, bog conditions covered the remains of the Boreal forests. Thus the climatic conditions appeared to have been wetter and more oceanic than in the preceding period, but the dominance of the relatively heat-loving oak on the more favoured sites indicates that the summer temperatures were probably at least not lower than to-day. At the end of this period the Neolithic cultivators probably made the first slight impression on the coastal fringes of the forests.

In sub-Boreal time, which synchronises with the development of the Bronze Age, there is abundant macroscopic evidence of an extension of pinewood, particularly in the Highlands, which spread over the drying bogs and reached higher elevations than its present limit. This indicates drier and less stormy conditions. Jessen [9] has suggested that the summer temperature reached its post-glacial maximum in Ireland during this period, and the evidence in Scotland suggests this also.

In sub-Atlantic time from about 1000 B.C. onwards there was retrogression of forest, particularly in the uplands and the west, and the growing bogs slowly replaced the forest on the less freely drained sites. Indeed this picture can still be seen to-day in some of the relict pinewoods in the west, where the old pine fails to regenerate on growing bogs and natural regeneration occurs only on gravel knolls and other better drained sites. Thus this cooler and wetter period, which has continued until to-day, caused a contraction in the pine and birch forests of the uplands and the west, and must also have been less favourable for the development of the lowland oakwood.

At the beginning of historical time, therefore, and before the serious impact of man upon them, our natural forests were of two broad types. First, the regions more favourable for tree growth in the Border country, the central plain, the coastal lowlands and the Highland valleys were covered probably with broadleaved forest of oak, birch, alder and other subsidiary species not dissimilar to the type which developed in earlier Atlantic time. There may have been a little pine in these forests, but these broadleaved species and the ground vegetation communities associated with them would compete successfully with pine, both in the regeneration and later stages of its development, except on the poorer soils. In the Highland uplands and in the west, pinewood and birchwood persisted from sub-Boreal times, but the more oceanic conditions of sub-Atlantic time had not only reduced their area in the battle with the growing bogs, but were less favourable for their growth except perhaps in the more continental regions of the eastern Highlands.

These ancient forests had a varied fauna : the woodland variety of the reindeer, the elk, the brown bear, the wolf, and others which have long since gone from our country, as well as many still existing, such as the red deer—to-day a puny creature compared with its prehistoric forest ancestors. Ritchie [10] has described brilliantly these woodland animals and their fate when the forests were destroyed.

The First to the Fourteenth Century

We thus know broadly what our forests were like at the dawn of our era, but what of their extent? Ritchie [10] has conjectured that, in sub-Boreal times, the peak of the extent of forest in post-glacial times, the forests covered about one-half the land area. That may well have been so, but as we have seen, the deterioration in climate in sub-Atlantic time, i.e. during the millennium before our era, favoured the spread of bog at the expense of the forest—particularly at the higher altitudes and in the west. Moreover, during this period man was already making his influence felt. Recent pollen analysis research in Denmark and England [8] has suggested that the Neolithic cultivators cut more heavily into the forest to provide agricultural land than had been thought previously, but the density of population in Scotland during that period was almost certainly less than in those countries, and it is probable that man did not reduce appreciably the forest area until Bronze Age and Iron Age times, and then only in the more favoured lowland and coastal regions covered by mixed oakwood.

When the need for wood charcoal for smelting was added to the manifold requirements for timber and domestic fuel, when forest was cleared for tillage and when domesticated grazing animals prevented natural regeneration on an increasing scale, then the shrinkage of the forest area due to climatic deterioration would be accelerated appreciably by man. At the dawn of our era consideration of what little evidence there is hazards a guess that forests might have covered about one-third of the land area of Scotland compared with the present 6·5 per cent.

There is very little historical evidence about our forests during the first millennium A.D. Roman historians speak of forests, bogs and morasses, and we no doubt had all three. The reduction in forest due to the causes already mentioned would continue, and in addition Tacitus in his *Agricola* [11] records the destruction of forest for military reasons. From then onwards, for example in John of Gaunt's invasion of Scotland in 1380, such destruction was added to the other causes, but too much emphasis should not be placed on this, because one would expect that there would be regeneration both by seed and, in the case of broadleaved species, vegetatively. While such destruction might convert closed into open forest, it would not itself result in complete destruction. Further, there is evidence during this millennium and, indeed, later that woods were destroyed because they harboured wild animals such as wolves and also human thieves, but again one would expect that the forest would grow again mutilated, but not destroyed. The progressive decline in the forest area is likely to have been due more to the conversion of forest into land for tillage and the grazing of domestic animals preventing regeneration than to cutting alone, although this has undoubtedly continuously impoverished it. In *Leges Forestarum*,[10] generally attributed to the twelfth century, there were penalties for the straying of cattle into the King's Forest, while at the end of the period under review there were large flocks of sheep on the lowland hills according to the testimony of Bishop Leslie in 1528.[12] The population was not large, but Lord Cooper [13] has conjectured recently from indirect evidence that in 1300 it was about 400,000 and almost all concentrated on the better land. This population subsisted largely at the expense of the forest. By the beginning of the fifteenth century there is abundant evidence from the charters of abbeys,[14] and the observations of early travellers such as Aeneas Sylvius,[15] afterwards Pope Pius II, who visited Scotland in the reign of James I, that the forests outside the Highland region were only a remnant of what they had been at the beginning of our era. While this applied especially to central and southern Scotland, it is interesting to note that it appeared to have been necessary in the reign of Edward I (1291) to take forty seasoned oaks from Darnaway Forest for the fabric of the Cathedral Church of Caithness.[16]

The importation of timber into Scotland began during this period and has continued ever since.[12, 14] There is some evidence that the first importation into England was as early as the eleventh century [12]; it was probably later in Scotland, but imported timber was used during the campaigns of Edward I and thus dated from at least the end of the thirteenth century.

The Fifteenth to the Nineteenth Century

The story up to the end of the fourteenth century is almost wholly of destruction of forest. While this continued, the fifteenth century saw the beginning of efforts to halt and reverse this process. From a Parliament in 1424 in the reign of James II until Scottish Parliaments ceased, there was a stream of legislation to halt destruction and enjoin the planting of woods. Some of this legislation does not appear to have been on practical lines.[12] For example, an Act was passed in 1609 prohibiting the manufacture of iron with wood. As there was then no alternative method, a licence was issued in 1612 for this purpose—and glass-making—for the whole of Scotland. It was not to be wondered, therefore, that no dramatic results followed from such legislation. Nevertheless, there is some evidence of enforcement in Baron Courts and other Registers.[14]

Until the beginning of the eighteenth century most of the trees planted were broadleaved ; this was to be expected, because such work was largely in the lowlands and coastal regions. The evidence of the continued shortage of timber and the testimony of travellers, however, show clearly that in the lowlands there was less and less woodland.

The forests of pine and birch in the Highlands first came into the picture in 1609 when joy was expressed in the Scottish Parliament at the discovery of woods in the Highlands. Their exploitation began and was accelerated rapidly after the pacification of the Highlands following the 1745 Rebellion. A vivid picture of the lumbering industry at Rothiemurchus at the beginning of the nineteenth century, the sawmilling and floating of the timber down the Spey, is given in the *Memoirs of a Highland Lady*, the autobiography of Elizabeth Grant of Rothiemurchus.[17] During the Napoleonic wars, when our overseas supplies of timber were interrupted and the need of it for shipbuilding as well as for other purposes increased, our home woodlands made an important contribution to the nation's war effort—as they have done in later wars. For example, in the twenty-two years from 1783, " 47 sail of ships of upwards of 19,000 tons burthen and the largest was 1050 tons " were built at the mouth of the Spey from timber cut in the Duke of Gordon's Glenmore Forest. A board of Scots pine from this forest and period, and with the above contemporary statement, is now in the Forestry Department, University of Aberdeen. Moreover, until the middle of the last century the need of wood for smelting continued to devastate Highland forests,[10] and the expansion of sheep-grazing was even more destructive.[18]

Although planting, particularly of broadleaved species, was carried out in the earlier centuries, the first large-scale work dates from the beginning of the eighteenth century. The then Earl of Haddington [19] was a pioneer particularly in the planting of Scots pine which was raised from seed from Highland forests ; there was a regular trade in pine seed from the Highlands. This extension of Scots pine from its indigenous region north of the Forth at a time before the Highland forests were decimated, to the Lowlands and Border country and later to England, helped to perpetuate the distinctive Scottish strains of pine.

The eighteeenth century also saw extensive planting of the indigenous oak—for example, at Darnaway Forest, Morayshire, which had furnished naturally grown oak from the thirteenth century onwards for use often far from it, as mentioned already.

The most interesting advance in the eighteenth century, however, was the use of European species not indigenous to Scotland. As early as the sixteenth century, it was fashionable in England to introduce forest trees, mainly for interest and ornamental purposes, and *Pinus pinaster* and Norway spruce are known to have been introduced into England at that time. In 1629 Parkinson [20] described larch, spruce and cypress, and Evelyn [21] referred to others such as Silver fir (*Abies alba*) in 1729. Scottish lairds followed—for example, spruce was used as an ornamental tree in 1682 at Inveraray.[22] It is a token of the interest in trees at that time that, during a raid on the Campbells in 1689, the Atholl men included conifer plants amongst the booty. Thus were these new species prized and spread. In 1725 the European larch, which has since figured so largely in Scottish forestry, was first planted in Scotland at Dawyck, Peeblesshire. The first large-scale planting of larch in Scotland, however, was by the Dukes of Atholl, particularly the fourth Duke.[23] From Perthshire it was taken to Monymusk by the father of the famous Sir Archibald Grant, and quickly became the most popular species in Scotland.

At the time when larch was beginning to play an important part in Scottish forestry a Perthshire man, Archibald Menzies, a surgeon with Vancouver, was discovering on the Pacific coast of North America two species which were to enrich our tree flora.[23, 24] In the early summer of 1792, while cruising up the coasts of Oregon, Washington and British Columbia, he saw and described Douglas fir (*Pseudotsuga taxifolia* Britt.) and Sitka spruce (*Picea sitchensis* Carr.). He did not bring back seed, but his fellow-countryman, David Douglas, sent seed home which arrived in Britain in 1827.[23, 24] There was great interest in the introduction of tree species at this time and different expeditions were made for this purpose. In 1850 a society of Scottish landowners, the Oregon Association, sent Jeffrey to America to make collections of seed, and in 1861 Veitch introduced Japanese larch (*Larix leptolepis* Murr.) from Japan. These and other new species were first used as specimen trees and later in small-scale plantations. By the end of the nineteenth century their possibilities were beginning to be assessed, and the foundations laid for the pattern of forestry in the present century. The growing interest in forestry during the second half of the nineteenth century in Scotland is shown by the foundation in 1854 of what is now known as the Royal Scottish Forestry Society.

The Twentieth Century

On the basis of a Census of Woodlands carried out in 1924,[25] there were at the beginning of this century in Scotland 1,074,224 acres of woodland, including 208,359 acres of scrub woodlands mostly used for grazing and not for timber production; this was 5·6 per cent. of the land surface. These consisted partly of areas of semi-natural

mixed oakwood, the remnants of our natural pinewoods, and semi-natural pinewoods which had been regenerated naturally from planted woods, particularly in Strathspey ; but most were planted woodlands. Some of the latter were of oak and other broadleaved species, but they were predominantly coniferous. The principal species was Scots pine ; much of it, however, was not of the Scottish strain of this species, because from the middle of the nineteenth century there had been large importations of Scots pine seed from Germany, and thus from a more continental climate. There were large areas of European larch, both in pure woods and mixed with pine. The area of spruce was relatively small. There were small areas also of the more recently introduced conifers, such as Douglas fir, Sitka spruce and Japanese larch. These woods ranged in age up to 150 years, and thus some dated from the first great planting efforts in the eighteenth century.

Up to this time forestry had been left entirely to the interest and enterprise of private landowners; some had engaged in forestry for the production of timber, but many had formed their woods either from interest or to improve the amenities of their estates. The home timber trade was small, because the rapid rise in the population during the nineteenth century, as the result of the industrial revolution, had made it necessary to rely more and more on imported timber from the Baltic, North America and elsewhere. At the beginning of the century about 95 per cent. of our requirements of timber and wood products were imported. The importance of forestry and timber production in the economy of a country was not realised except by a relatively small band of enthusiasts. They were, however, active and a Departmental Committee had been appointed: " To report as to the selection of a suitable location for a Demonstration Forest Area for Scotland, . . . and the further steps necessary to promote silviculture in Scotland." It reported in 1912.[26]

Then came the first world war. Timber is one of the bulkiest of cargoes, and it was realised that home timber production would have to be expanded. A Timber Supplies Department was organised under the Board of Trade, the sale and purchase of standing timber was subject to licence and maximum prices laid down. Canadian and Newfoundland military companies were brought over to expand the production of sawn timber, and later, German prisoners of war were used. As the submarine campaign became intensified the importance of adequate internal timber supplies, if only for reasons of security, was realised more vividly than it had been in this country since at least the Industrial Revolution. The modern industrial state cannot function without adequate timber supplies for a multitude of purposes. While in wartime the large supplies needed for house-building are not required because of lack of labour for construction, and non-essential uses can be reduced or extinguished, nevertheless there are large requirements in the coal-mining industry and in the maintenance of the railway system and equipment, as well as large service requirements. If overseas imports are seriously interrupted by shortage of shipping, as then happened, the importance of forestry becomes clear.

The present broader national interest in forestry is thus one result of war and, in particular, of the submarine which forced the felling of over 200,000 acres of Scottish woodlands during and immediately after the first world war.[25] The Ministry of Reconstruction appointed a Sub-Committee on Forestry and it reported in 1917.[27] Its Report, usually called the Acland Report after its Chairman, the late Sir Francis Acland, came to conclusions which may be summarised very briefly as follows :

(*a*) The pre-war area of woodland (in Britain) of about three million acres was inadequate ;
(*b*) The replanting of what was felled and the maintenance of that area could be left to its private owners with some financial assistance from the State ;
(*c*) In addition, a scheme of State afforestation should be instituted under a forest authority and that 150,000 acres be planted in the first ten years and 1¾ million acres in eighty years. This was to be of coniferous species and, in addition, a small area of hardwoods was to be planted.

No separate target was laid down for Scotland, but during the inter-war period rather more than one-third of the area planted by the Forestry Commission was in Scotland.

The Forestry Commission for Great Britain was set up in 1919. Almost all other European countries already had state forestry departments, most for long periods. It had only begun its task when the Committee on National Expenditure (The Geddes Committee, 1922) recommended its extinction. Fortunately for the country the Government of the day did not accept this particular recommendation. Nevertheless, the funds available were drastically reduced for a period. The Acland Scheme for State forestry, however, got under way, and, except for a few years during the depression in the early 'thirties when funds were again cut, progress was steady. During the period 1929 to 1938, 125,000 acres were planted in Scotland by the Forestry Commission ; as already mentioned, no separate target was laid down for Scotland, but for the United Kingdom the area planted during this period was 75 per cent. of the Acland target for State planting.

The pattern of this State forestry differed in several respects from that of private forestry built up from the eighteenth century onwards. First, the Forestry Commission was charged with the creation of forests, and for administrative and technical reasons it was desirable that the forest units should be as large as possible. Secondly, the land most readily available for the extension of our forest area was the poorer rough grazings, the upland heaths and the peat moorlands. This raised many technical difficulties because, as already noted, their successful afforestation was a battle with nature. Some private owners, such as the Dukes of Buccleuch, Sir John Stirling Maxwell and others, had done pioneer work in the afforestation of difficult land. On this foundation the Forestry Commission have since conducted intensive research and experiment into these problems. They are not entirely

solved, but great advances have been made.[4, 5] Finally, there were changes in the species of tree used, partly because of the knowledge and experience already built up by private forestry about the more recently introduced species, and partly made necessary by the difficulties met with in afforesting certain types of poor land. The spruces, both Norway and Sitka, have been planted much more extensively,[28] the former on the better moist sites, and the latter on the more difficult land including peat moorlands, both pure and in mixture with pines. *Pinus contorta* var. *latifolia* S. Wats., a North American species which has very low fertility requirements, has been used in part for this mixture, and also pure on limited areas of the worst *Scirpus caespitosus* peatlands and on the poorest upland heaths. European larch has given way to a considerable extent to Japanese larch, particularly in recent years when a dieback condition in the former did extensive damage, particularly on trees grown from seed of Swiss or Austrian Alps origin. *Larix eurolepsis* Henry, a natural hybrid from European and Japanese larches, which originated at Dunkeld in 1902, and which is also so far immune to certain common larch diseases, has also been used as far as seed supplies have permitted. Scots pine has continued to be an important species, particularly in the more continental climatic conditions and on the heath types in the north-east of Scotland. Corsican pine (*Pinus nigra* var. *calabrica* (Loudon) Schneid.) has been used on the maritime sand dunes at Culbin and other forests on the Moray coast and at Tentsmuir Forest at the mouth of the Tay. Douglas fir has not been used extensively ; it requires sheltered and relatively fertile conditions and is apt not to be windfirm on soft soils. It has been used to some extent for underplanting birch and larch. Other North American species such as *Tsuga heterophylla* Sarg., *Abies grandis* Lind. and *Thuya plicata* D. Don, have been used on a limited scale on the better soils, as they have been by private owners for several decades.

The Acland Report had assumed that private owners would, with some financial help, be able to replant the woodlands felled during the 1914-18 war. That war, however, produced far-reaching social and economic changes, and the increased burden of taxation made it difficult for private owners to finance this work at the higher level of costs then prevailing. Moreover, particularly in the 'thirties, the level of timber prices did not encourage enterprise. The result was that in the twenty years from 1919 the owners of private forests, on balance, only planted what was felled during that period, and the large war fellings were not replaced ; some owners, of course, were able to make good what had been felled.

In 1939, the total effective area of woodland in Scotland, including that planted by the Forestry Commission, was probably rather less than in 1914. Much of it, moreover, was young and not yet productive, and the volume standing was, therefore, substantially less. Under these conditions a second world war was a disaster from the forestry as well as other points of view, because although resources in timber were less, the need for home-grown supplies was even greater. The expansion of the production of home timber supplies was organised

under the Ministry of Supply. The home timber trade greatly increased its output, assisted by the Canadian Forestry Corps, a military organisation which again introduced North American equipment and methods into Scottish forestry, by the Newfoundland Forestry Corps, a civilian organisation, and by direct departmental work using civilian British labour, male and female, and prisoners of war. A history of this important chapter in our forest history has been published.[29]

The success of this wartime effort left a terrible gash on our woodlands, and it was widened by the necessity of continuing felling after 1945, because of shortage of timber in exporting countries and currency difficulties. Again, practically all the felling had been in privately owned woods, because most of those planted by the Forestry Commission were too young to be productive. The forestry problem in this country was reviewed once more, this time in a Forestry Commission Report published in 1943.[30, 31] Briefly the proposals (for the United Kingdom) were as follows :

(*a*) Five million acres of land should be devoted to effective timber production. Of this total, two million acres were to be secured from the three million acres of existing woodlands, and three million acres afforested over a period of fifty years ;

(*b*) The two million acres of existing woodlands, including practically the whole area being felled for war purposes, was privately owned, and in order to secure its replanting and proper tending a scheme of so-called " Dedication of Woodlands " was proposed under which, in return for certain undertakings by the owner, the State offered financial assistance ;

(*c*) It was assumed that the three million acres of new afforestation would be undertaken by the State.

This policy was approved by the Government of the day in 1945, and after prolonged negotiations with representatives of private owners, a scheme of dedication was decided on, which the Royal Scottish Forestry Society and associations of owners were prepared to recommend to their members.[32]

No separate target was laid down for Scotland, but announcements since made indicate that it is expected that about half the five million acres of forest proposed for the United Kingdom will be in Scotland. If this objective is secured, Scotland will have about 13 per cent. of its land surface under productive forest, a not excessive proportion even although the pastoral industry is an important one in Scotland. A Census of Woodlands was carried out by the Forestry Commission in 1947-49, and the position as at the 30th September, 1947, in Scotland was as follows, in acres [28] :

	TOTAL WOODLANDS	PRIVATE WOODLANDS	STATE FORESTS
Grand total	1,266,838	1,024,008	242,830
High Forest—			
Total	573,336	373,247	197,089
Coniferous	439,084	247,453	191,631
Mixed	37,235	34,686	2,549
Broadleaved	97,017	94,108	2,909
Coppice—			
Total	576	537	39
Coppice-with-Standards	89	89	—
Coppice	487	448	39
Scrub	256,683	243,701	12,982
Devastated	33,636	27,401	6,235
Felled—			
Total	402,607	376,122	26,485
Before August, 1939	233,433	221,073	12,360
Since August, 1939	169,174	155,049	14,125

These figures are more eloquent than words to express the need of a great and sustained effort to recreate the forests of Scotland. At present less than one-half of the existing 1¼ million acres of forest land is productive forest—that is, high forest—while about one-third is felled and requires to be restocked.

Clearly the most important forestry problem in this country to-day is whether a sufficiently large proportion of private forest owners are able to join in this proposed joint effort of State and private forestry to rehabilitate our war-scarred woodlands. Many private owners have "dedicated" or are in the process of "dedicating" their woods. Since the end of the war the area replanted by private owners has been the maximum which plant supplies have permitted, and is about the target laid down for this period.[33] The rate of felling, however, although subject to licence and control, continues at a relatively high level. If private forestry can undertake the part allotted to it, this effort will be worthy of the important part it has played in the rural economy of Scotland during the past 250 years.

The Forestry Commission, which succeeded in planting a reduced area during the war years, has now stepped up its programme. The areas planted before 1939 are now being thinned and yielding produce, and this will increase year by year. Particularly in districts where there were few large private woodland estates the public is beginning to see the contribution which forestry can make to rural prosperity.

Forestry enriches and broadens the economy of every country that practises it, because many more people are needed in the manufacture of its produce than in the growing of it. Moreover, under scientific and systematic management, forests give a perpetual and increasing yield, and that from land which often is of little value for any other productive purpose. If and when Scotland has 2½ million acres of productive forest, she will be, on balance, a timber-exporting country and on a pre-war consumption level. That is to say, while she will need to import kinds and grades of timber and wood products which cannot be

grown in Scotland, these will be less in volume than that which she can export of her timber products. This will bring enrichment to her countryside. As some are now beginning to realise, if prosperity is to be brought to the Highlands, it will be by forestry more than any other development.

Finally, the returns from forestry are not solely in wood. When our hillsides are more extensively clothed by forest our rivers will be less liable to flood and our estuaries to silting. While tastes differ as between bare and wooded slopes, most prefer woodlands, and conifers as well as broadleaved species fit naturally into our landscape as they have done for 10,000 years.

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REVIEWS OF BOOKS

EUROPE

The Observer's Book of British Geology. By I. O. Evans, F.R.G.S. Foreword by Professor H. L. Hawkins, D.SC., F.R.S., F.G.S. $5\frac{1}{2}\times3\frac{1}{2}$. Pp. 266. 170 illustrations in black and white. 12 plates in colour. [The Observer's Books, 10.] London and New York: Frederick Warne and Co. Ltd, 1949. 5*s*.

This is a welcome addition to that useful series *The Observer's Books*. The author has succeeded in giving an excellent though necessarily abridged account of the geological structure and composition of these islands. Besides lucid descriptions of the rocks and their origins, there are the necessary explanatory accounts of their mineral constituents. Fossils receive particular attention, and a well-illustrated chapter covers their range from the earliest types of life up to primitive man. Their use to the geologist is demonstrated for the compilation of the geological time scale, and the various formations in this record receive adequate attention. The effects which weather and geological structure have had in determining the scenery and economic development for the different parts of the country are explained.

The value of this book is greatly enhanced by a fine series of illustrations.

D. H.

Canals, Barges and People. By John O'Connor. 6×8. Pp. 96. Coloured engravings by the author. End-paper maps. London: Art and Technics Ltd, 1950. 10*s* 6*d*.

There is a growing volume of popular literature on the subject of canals, among which this little volume has a worthy if not outstanding place. It consists of a series of brief pictures of life on and along British canals, penned with a close observation and attention to detail born of the author's deep interest in his subject. There are numerous wood engravings illustrating the text, drawn by the author. H. P. W.

Four Main Lines. By Hamilton Ellis. 9×6. Pp. 225. 70 illustrations. London: George Allen and Unwin Ltd, 1950. 16*s*.

It is difficult to speak too highly of this book. The author has marked the metamorphosis of British railways into British Railways by an account of the history and separate personalities of four important main lines: the West and East Coast lines to Aberdeen, and the Great Western, and the London and South Western lines to Devon and Cornwall. He has illuminated fact with reminiscence and spiced the whole with ready wit and racy style. A unique collection of photographs, both old and new, illustrates the book, together with reproductions of the author's own oil paintings of period trains. These betray careful research and great fidelity. The *pièce de résistance* is of the now almost legendary North British locomotive of 1851 in its livery of Royal Stewart tartan. To railway enthusiasts Hamilton Ellis is his own recommendation, to geographers the book reveals how geographical factors have influenced not only the growth but the regional differentiation of British railways, and the general reader may learn in the most pleasant way the heritage of service and exciting history of our railways. H. P. W.

Scots Fisherfolk. By Peter F. Anson. $7\frac{1}{2}\times5$. Pp. viii+166. 24 illustrations by the author. 8 sketch maps. Banff: *The Banffshire Journal* Ltd, for the Saltire Society, 1950. 7*s* 6*d*.

This is a delightful and most instructive little book, with charming illustrations by its artist-author, who has lived amongst the fisherfolk of Eastern Scotland most of his life and knows them intimately. There are most interesting chapters on the social background of the Fisherfolk, and on their superstitions—the latter a particularly valuable one for Scottish folklorists, telling of many little-known customs of both East and West Coast fishermen. There is also an account of the methods of fishing, of the herring fishing during the second world war, of the different types

of vessels, with illustrations, and a series of maps at the end shows the chief fishing districts of Scotland with the value of the catch in 1948. An appendix gives the number of vessels and fishermen and the quantity and value of fish landed in Scotland in 1938 and 1948. There is a valuable bibliography, and Mr R. Stuart Bruce of Whalsay, Shetland, adds interesting details of old types of Scottish fishing vessels. This is altogether an interesting and valuable addition to the Saltire publications. I. W. H.

Scottish Railways. By O. S. Nock, B.Sc., A.M.I.C.E., M.I.MECH.E., A.I.LOCO.E. 9×6½. Pp. x+214. 16 line illustrations. 14 colour plates. 16 black and white plates. Edinburgh and London : Thomas Nelson and Sons Ltd, 1950. 18*s.*

In this general but interesting account of the development of Scottish railways prior to nationalisation, the outstanding feature is the way in which the author has expressed the spirit of the old railway companies. That " Glasgow was the largest locomotive building centre in Europe " in 1913, and that in 1936 the " Princess Elizabeth " travelled from Glasgow to London in 5¾ hours, is witness of the magnificent work and of the pride and enterprise which went to build up the Scottish Railways.

Certain aspects of the book, such as are contained in the chapters on " The Great Scenic Routes " and " Railways in Scottish Industry," are of particular interest to geographers, but the attractive style of the writer and the general content of his book must make a much wider appeal. There are many first-rate descriptive passages, there is no burden of technical detail, and the author's general treatment of his subject has a sound factual basis. The illustrations are excellent, and only a map seems to be lacking. Possibly the author's view-point is too frequently the foot-plate, but this makes the reading of his book all the more fascinating.

D. R. M.

Scottish Crafts. By Ian Finlay. 10×7½. Pp. 128. 16 plates in colour. 68 plates in black and white. London : George G. Harrap and Co. Ltd, 1948. 17*s* 6*d.*

This very useful summary of Scots handicrafts is made delightful reading because of the deep knowledge and love of the author in his subject, and because he is himself a skilled craftsman in conveying something of his own sensitive appreciation to his readers. His allusions to the wider European development of the crafts is specially interesting.

In what is a compendium, covering a wide field, it is natural that Mr Finlay should be more completely at home in some branches of his subject than others—the attraction of work in such hard substances as wood, stone, and metal seems to be specially strong and he seems to be least happy in dealing with Highland textiles.

The fine illustrations add very much to the value of the book, but, if a small grumble may be allowed, as they are spaced through the book with little relation to the letterpress actually dealing with their subjects, a reference would be very helpful. I. F. G.

The Shetland Isles. By Andrew T. Cluness. 8½×5½. Pp. xii+308. 49 photographs. Map. [The County Books.] London : Robert Hale Ltd, 1951. 15*s.*

Any book written on a region by one deeply interested in and passionately proud of it is bound to be readable, and this is no exception : Shetland is a most fascinating country, and no one could be more steeped in its lore than Mr Cluness. The book is by no means a geography : half of it is popular history and folklore, there is a guide-book description of the islands one by one. " Uyeasound in the south has a fairly good harbour, protected, except from the south, by the isle of Uyea, home of the recent M.P. for the Orkney and Shetland Islands," followed by snippets on place-names, dialects, etc. Considerable repetition is thus involved and there is a tiresome tendency to prolixity.

Many Shetlanders will blush for, and southrons be irritated by, the recurring assertions that this or that feature of Shetland is the biggest or the smallest, or the best or the worst in the country, if not the world. Local patriotism isolated and inbred can come very near to the ridiculous.

There are magnificent full-page photographs and a map. R. M.

The Estate and Castle of Skibo. By WILLIAM CALDER. 8½×5½. Pp. 80. 14 illustrations. Edinburgh : The Albyn Press, 1949. 6*s*.

Into this clearly written survey of the history of the Estate of Skibo has gone a good deal of sound historical study. Indeed, this little book provides a clear picture of the successive changes of our national history, from prehistoric times to the present day, as they affected a not inconsiderable stretch of territory in the County of Sutherland adjacent to the northern shore of the Dornoch Firth; it even glances across the Firth to the Royal Burgh of Tain in the neighbouring County of Ross and Cromarty. While naturally a great deal of emphasis is laid on the tenancy of Mr Andrew Carnegie, the important contribution made to economic progress in eighteenth-century Scotland by an earlier Laird, Mr George Dempster, receives adequate notice. The photographic illustrations are very pleasing. G. P. I.

The Capital of Scotland : A Twentieth-Century Contemplation on Edinburgh. By MORAY MCLAREN. 9½×6½. Pp. vii+179. 17 illustrations. Edinburgh : Published for The Rt Hon. Sir Andrew Murray, Lord Provost of the City, by Douglas and Foulis, 1950. 21*s*.

Edinburgh citizens and many others must be grateful to Lord Provost Sir Andrew Murray, at whose instigation and for whom this delightful dissertation on Scotland's Capital was written. It is certainly no ordinary history or guide-book. In entertaining fashion Mr McLaren discourses on his own personal reactions to, and opinions about, the Edinburgh of to-day and the immediate yesterday. Amongst other matters he discusses Edinburgh character, Edinburgh suburbia, Edinburgh hospitality, Edinburgh and the Festival, Edinburgh and the Future, Edinburgh Climate and Light. On the note of the Edinburgh light—which has no connection with gas or electricity—the author closes his delightful " excursion." If the reader may not always agree with all he says, he will enjoy it all.

The illustrations of old Edinburgh chosen by Mr R. H. Westwater, A.R.S.A., are one of the most interesting features of this fine book and will evoke some sad reflections about the unplanned bungaloid growths of the pre-war decades. It is good that our town-planners of to-day seem to have awakened to this danger and that Edinburgh of the future, like Edinburgh of the New Town in the 18th century, will not arise unplanned. Messrs Douglas and Foulis are to be congratulated on the beautiful and artistic production of this book, which is well worth the price asked. I. W. H.

In the Steps of St Mungo. By A. G. WILLIAMSON. 7¼×4¾. Pp. 130. 9 photographs. Edinburgh : The Ettrick Press Ltd, 1950. 10*s* 6*d*.

In this interesting little book the author starts from the Molendinar Burn in the heart of Glasgow and describes the country and towns around Glasgow, from Kilpatrick and Dumbarton to Ardrossan and Troon. He ends his pleasant pilgrimage at Renfrew, where he bewails the recent destruction of the historic old royal castle of Renfrew to make way for a new housing scheme. Let patriotic Scots take note of his comment : " This could not have happened furth of Scotland. I am convinced of that."

There are excellent photographic illustrations and Mr Williamson sheds many interesting sidelights on less well-known scenes of Scottish history, but whilst he is keenly interested in preservation of historic buildings, botanists may smile a little wryly at his naïve statement on page 47 : " I saw clusters of thistles everywhere on Dumbarton Rock that afternoon but only one milk-thistle, which I immediately plucked. Once so common in Scottish fields and by Scottish roadsides, this national emblem is in danger of becoming extinct unless some organised attempt is made to protect it from the sickle and the hoe."

" And " one might have added : " from the hands of marauders who would prevent it setting seed " ! Incidentally, the milk-thistle is not the Scottish thistle of heraldry. That distinction belongs to the large *Onopordon acanthium*, which—strangely enough—is not found wild in Scotland. I. W. H.

Places of Natural Beauty. By D. M. Matheson. National Trust Guide. 7¼×5. Pp. 170. 23 illustrations. Sketch maps. London : B. T. Batsford Ltd, 1950. 8*s* 6*d*.

This is a pocket-size guide to the National Trust of England's landscape properties, which complements the already published guide to the buildings held by the Trust. It makes very pleasant reading in an age when natural beauty is so little regarded. The Trust now owns a really remarkable number of properties of natural beauty both large and quite small, and no better or more convenient guide to them could be found than this little book compiled by the late secretary to the National Trust. It is much to be hoped that a similar guide may soon be compiled for the properties held by the National Trust for Scotland. I. W. H.

Derbyshire. By Crichton Porteous. 8½×5½. Pp. viii+310. 49 photographs. Map. [The County Books.] London : Robert Hale Ltd, 1950. 15*s*.

Like any series written by different authors with as many different approaches, some volumes in *The County Books* are better than others. It is difficult to resist the impression that *Derbyshire* is one of the less successful. Mr Porteous knows and loves his Derbyshire and in parts the descriptive matter is excellent, but the work as a whole lacks form. In following the author's rather confused trail one quickly loses sense of direction. Nor is he sufficiently explicit for the stranger, and so one still remains in ignorance of the location of the famous caverns of the Peak. However, for all its drawbacks, the book is very readable, the author is commendably aware of the fundamental importance of geology in topography, while the photographic material is first class. H. P. W.

Derbyshire. By Thomas L. Tudor, f.r.g.s. Revised by E. Carleton Williams, f.s.a. 6×3½. Pp. x+180. Photographs. End-paper maps. [The Little Guides.] London : Methuen and Co. Ltd and B. T. Batsford Ltd, 1950. 7*s* 6*d*.

This handy little pocket guide has been recently revised and brought up to date. Mainly consisting of a description of places arranged alphabetically, it also has a long introduction on the geology, natural history, architecture, and so on, of the county as a whole. Well illustrated with good photographs, it is to be recommended to all visitors to the county. H. P. W.

Island of Skomer. Edited by John Buxton and R. M. Lockley. 8½×5½. Pp. 164. 28 illustrations. London : Staples Press Ltd, 1950. 18*s*.

A number of local naturalists, forming the West Wales Field Society, embarked on a scientific survey of the now uninhabited island of Skomer off the south-west coast of Wales at the entrance to St. Bride's Bay. It is mainly a volcanic plateau covering about 720 acres. No aspect of the island escaped their notice, but birds and seals were their chief interests. The ecological studies are noteworthy. Migration receives full attention. One mistake is the statement that the Atlantic grey seal is the rarest of all seals : this distinction belongs to the Ross seal of the Antarctic. The maps are excellent. R. N. R. B.

Leinster, Munster and Connaught. By Frank O'Connor. 8½×5½. Pp. 296. 49 illustrations. Map. [The County Books.] London : Robert Hale Ltd, 1950. 15*s*.

Having a profound knowledge of its history, literature, and people, Frank O'Connor writes of his native land, Eire. He does so critically, wittily, and without sentimentality. Within the provinces of Leinster, Munster, and Connacht he leads one with agility from one aspect of the landscape to another. He casts illuminating light on types of architecture, dips into history and literature, weaves into the text pictures of personalities, past and present. These varied aspects are skilfully blended to present a vivid picture of Eire. His book makes fascinating reading and is generously supplied with plates, many of which are exceptionally fine representations of existing architecture. J. T.

Norway To-day. Edited by PER VOGT. 11½×8½. Pp. 160. Illustrated. Oslo: Dreyers Forlag. Fourth edition, 1950. London: George Allen and Unwin Ltd. 30*s*.

Here is a superbly illustrated volume on every aspect of Norway. The letterpress is slight and sketchy and written from a popular point of view with little, if any, scientific value. If one has never had the good fortune to go to Norway, this volume will rouse longing to visit it and see for oneself its endless splendours. The book was originally published in Norwegian. R. N. B. R.

Norwegian Holiday. By HARLAN MAJOR. 8×5½. Pp. xi+268. Illustrated. New York: Funk and Wagnalls Company, 1950. London: The Mayflower Publishing Co. Ltd. 27*s* 6*d*.

A book giving economic and historical information to the prospective traveller in Norway. Certainly in that respect it should be useful. The author is well known as a fisherman and gives full measure to fish and fishing rivers, but motor routes have almost equal importance to him. It is a pity he did not devote a chapter to Svalbard, since tourists can now reach that land. If we have one serious criticism to offer of the volume it is its high price even in these days of expensive books. There are numerous illustrations. R. N. R. B.

Oslo—Norges Hovedstad: Kunst og Åndsliv ved 900-*Års Jubileet*. [Oslo—The Capital of Norway: Art and Intellectual Life at its 900-Years Jubilee.] Edited by CARL FREDRIK ENGELSTAD. Translation by R. J. Christophersen and E. L. de R. Endresen. 11½×8¼. Pp. 190. Illustrated. Oslo: Programbyrået, 1950.

This handsome volume, illustrated with photographs on almost every page, is printed in double columns, Norwegian on the right, English on the left. It is intended to give a glimpse of the cultural and spiritual life of Norway, especially as this is reflected in the present state and in the history of Oslo, and to send a greeting to the world from Oslo on the occasion of the nine-hundredth anniversary of its foundation.

The title suggests very well the contents of the book. It opens with a general article on the Capital and then brings separate chapters on literature, painting, sculpture, church, theatre, university, music, applied arts, the city's half-dozen collections and museums being specially dealt with by their curators. All these articles are readable, and for most of us they would certainly prove to be informative and interesting. The contents and their presentation are excellent. R. T. C.

The Lapps. By BJÖRN COLLINDER. 8½×5½. Pp. x+252. Frontispiece. 25 plates. 2 maps. Princeton: Princeton University Press, for the American Scandinavian Foundation, New York, 1949. $3.75. London: Geoffrey Cumberlege, 24*s*.

A short but scholarly study of the Lapps, touching every side of their life and activities with special stress on their language and tradition, which might be expected from the author, who is the professor of Finno-Ugrian languages in the University of Uppsala. The only aspect he seems to avoid is the debatable origin of the race. Nowadays they are a mixture of many races with strong relationship to the Finns, but their origin is still obscure. The book is a valuable geographical study of a civilisation based on a reindeer economy. The author avows that his knowledge of the Lapps is incomplete, but he admits to having spent at least three years of his life among them. Certainly he has written an authoritative work. R. N. R. B.

Geographisches Taschenbuch: Jahrweiser zur deutschen Landeskunde, 1950. Edited by E. MEYNEN. 6¾×4¾. Pp. 289. 3 maps. Stuttgart: Reise- und Verkehrsverlag, 1950.

This serviceable year-book [see *S.G.M.*, 1949, 65 (*3*): 152-153] has been brought up to date and augmented. A climatic map of Central Europe, a map of the natural regions of Germany, and one showing the distribution of electric power stations and grid in the *Bundesrepublik*, with relevant information, are welcome. Other noteworthy additions are definitions of German hydrological and pedological terms and new symbols for mapping land use and settlements. J. H. K.

The Sisters Alsace-Lorraine. By BERNARD NEWMAN. 8½×5½. Pp. 252. 29 illustrations. 6 sketch maps. London : Herbert Jenkins Ltd, 1950. 15*s.*

The names Alsace and Lorraine have disappeared from some modern maps and atlases, being supplanted by the less romantic Départements of Haut-Rhin, Bas-Rhin, Moselle, Meurthe-et-Moselle, and Vosges. It is with the first three and part of the last that the author deals, regions where the inhabitants have drawn from French and German ideas but have kept their own traditions. He covers the ground with his bicycle ' George,' and gives helpful information to those who favour the wheel for travelling. Carrying out his resolution never to sleep until he has learned one new fact or absorbed one new idea during the day, he ferrets out odd—and often forgotten—bits of history, retailing them as he goes along, A book in this author's familiar vein, to enjoy whether wandering about these frontier regions or sitting in one's armchair. H. S.

Mediterranean Blue. By SISLEY HUDDLESTON. 8½×5½. Pp. 132. Illustrated. [Windows on the World.] London : Evans Brothers Ltd, 1948. 10*s* 6*d.*

One of the *Windows on the World* series, this volume deals with the Midi, " the melting-pot of all Mediterranean peoples," and is a condensation of 30 years' holidays in this region. The writer covers the Départements of the Vaucluse, Bouches du Rhône, Var, and Alpes Maritimes, and includes the Gulf of Genoa as far as Spezzia, recalling memories of Cannes, Nice, Monaco, Monte Carlo, Mentone, and a host of smaller towns and villages, both on the coast and in the hinterland, known to the traveller de luxe as well as to the humbler itinerant. There is a brief ' coda ' on Corsica. Although many of the smaller places receive only a fleeting glance, the author has something to say about them all, enhanced by his facility in sketching short, vivid biographies of local and national celebrities. A book to have and to treasure. H. S.

A History of Mountaineering in the Alps. By CLAIRE ELIANE ENGEL. Foreword by F. S. Smythe. 9½×6. Pp. 296. 26 illustrations. London : George Allen and Unwin Ltd, 1950. 21*s.*

This is the first really comprehensive history of mountaineering in the Alps to be published in English. It is written by a Frenchwoman in English. The language leaves nothing to be desired.

Mlle Engel goes back to the earliest travellers in the Alps and brings the work right down to modern times, including modern technique. The story of the first ascent of the Matterhorn has been dealt with so fully in the past that she is wise in being brief on this subject, but she deals at length with the history of the exploration of Mont Blanc, and this part of the book is of special interest.

Our magazines have from time to time contained articles describing the adventures of Prisoners of War and other fugitives who escaped over the higher passes into Switzerland, and Mlle Engel has much to say on this, as also on the battle between the Free French and the Germans. At the other end of the scale, we are glad to see that the author gives prominence to the work carried out a century ago by J. D. Forbes, at one time Professor of Geology at Edinburgh University and, later, Principal of St Andrews University.

The illustrations are good, and the book is a most valuable contribution to Alpine literature. A. H.

The Alpine Highways of Switzerland. By BRUNO WAGNER. 8×5¼. Pp. 125. 35 photographs. Drawings. London : Edward Stanford Ltd, 1950. 7*s* 6*d.*

Bruno Wagner's descriptive account of the Swiss alpine highways is now published in English and should prove invaluable as a guide-book for the many motorists who annually cross the magnificent network of roads which now traverses the Alps between Switzerland, Italy, and Austria. There are charming drawings by Paul Ceres and excellent photographs by Michael Wolgensinger. The descriptions of the routes traversed—which include all the principal passes from Switzerland across the Alps—are more than mere word-pictures of the scenery: they contain much of interest to geologists, archaeologists, and historians. I. W. H.

The Selective Traveller in Portugal. By Ann Bridge and Susan Lowndes. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. x+290. 54 illustrations. Map of Madeira. 6 maps of Portugal. London : Evans Brothers Ltd, 1949. 21*s.*

The *Selective Traveller in Portugal* is a volume written with great charm and is one which should be read by all visitors to that delectable land, whether as a preparation for a visit or to revive the memories of a tour. Whilst on occasion one feels there is undue emphasis on ecclesiastical remains, nevertheless that is by no means the content of the book. Geographers will appreciate the chapter on " The Land and People " and the coloured Michelin route-maps. These maps, without relief representation, are clear, and provide a valuable aid to using the text and many photographs.

A. C. O.

Rome. By Edward Hutton. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. xii+297. 32 plates. London : Hollis and Carter Ltd. Seventh edition, 1950. 16*s.*

To parody Lord Byron, " Rome owes to Hutton what whist owes to Hoyle." The author has rewritten his work on Rome which previously ran to six editions. He has written for lovers of the Eternal City a book packed full of history, reconciling the ancient and the modern Rome, and explaining the secret of her immortality. One misses the illustrations in colour of previous editions, but this is more than offset by the high artistic quality of the numerous plates. In spite of so much historical detail, the author has a poet's eye for the glories of the sunsets of Rome. The book has been brought up to date to include the results of recent excavations. It is welcome to note that in describing the Stuart monument in St. Peter's the author has omitted the undignified outburst against George IV which marred previous editions. New features are the valuable appendices : on Christian Mosaics, certain Baroque Architectural Works, and Pictures of the Seventeenth Century in Rome. The plan on the inside cover might have been retained with advantage.

H. S.

UNION OF SOVIET SOCIALIST REPUBLICS

Natural Regions of the Union of Soviet Socialist Republics. By L. S. Berg. Translated from the Russian by Olga Adler Titelbaum. Edited by John A. Morrison and C. C. Nikiforoff. $9\frac{1}{2}\times6\frac{1}{4}$. Pp. xxxi+436. 81 illustrations. 23 maps. 30 tables. Bibliography. Glossary. New York : The Macmillan Company, 1950. 75*s.*

The appearance of the English translation of *Natural Regions of the U.S.S.R.* has approximately coincided with the death of the author, Professor Lev S. Berg, President of the All-Union Geographical Society of the U.S.S.R. [Obituary, *S.G.M.*, 67(*1*) : 64]. Professor Berg, who devoted his long life to studying in the field, in museum, and in library all aspects of the physical and biogeography of the Union, first published his great synthesis of physical geography, *The Landscape-Geographical Zones of the U.S.S.R.*, in 1930. This volume embodied the culmination and integration of a life's work in zoogeography, plant ecology, geomorphology, soil science, and climatology. The ideas about physical landscape zones expounded in it were so well received that for the use of students Professor Berg incorporated them in text-book form under the title *Natural Regions of the U.S.S.R.*, first published in 1937. It is this book, which has already been translated into French, that now appears in an English translation.

The work was sponsored by the Russian Translation project of the American Council of Learned Societies founded in 1944. According to J. A. Morrison, the Chairman of the Administrative Committee of the Project, the translator has followed the original Russian text scrupulously, and although certain sections, notably those on the flora and fauna, are more detailed than is necessary for most students of geography, the detail will no doubt be welcomed by plant and animal geographers. Thus while primarily intended for students of geography, it is hoped that the book will serve as a reference work on the U.S.S.R. for all students of the natural sciences.

The systematic arrangement of the book makes it convenient for reference. Professor Berg divides the Union into two major sections, the lowlands and the

mountains. Among the lowlands he distinguishes the following landscape zones : the tundra, the temperate forest, the forest steppe, the steppe, the semi-desert, the desert, and the sub-tropical forest ; and among the mountains, the Caucasus, the mountains of the Crimea, the Urals, the mountains of Soviet Central Asia, the Altai mountains, the Sayan mountains, Lake Baikal and the Trans-Baikal Region, the mountains of north-eastern Siberia, the mountains of the Far East, Sakhalin, Kamchatka, and the mountains of the Arctic. Each of these zones has a chapter to itself in which he deals with general characteristics. C. P. S.

ASIA

The Middle East : A Physical, Social, and Regional Geography. By W. B. Fisher, B.A., DR. DE L'UNIV. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. xiii+514. 93 figs. 2 folding maps. London : Methuen and Co. Ltd ; New York : E. P. Dutton and Co. Inc., 1950. 27*s* 6*d*.

In this first comprehensive geography of the area, Dr Fisher shows that the popular term ' Middle East ' can be applied to a definite region, extending from Cyrenaica to Persia and from Aden to Turkey. Among its distinctive features he lays stress on poverty of resources, with the special exception of oil, and on nodality as a factor in military and political strategy, in the intermingling of peoples, and in the development of city life, often in conflict with that of cultivators and nomads.

The book is divided into a first half dealing generally with physical, social, historical, and economic geography, and a second half giving more specific accounts, mainly physical and economic, of six major sub-regions. Some of the material is well known, but much is derived from wartime and other recent investigations, including the author's convincing interpretation of the mechanism of climate and his shorter study of population density and growth in relation to natural resources. The subject-matter is illuminated by a readable style and by interesting observations on a wide variety of topics, of which those on sub-regional climates and their effects on agriculture and daily life give much local colour. The treatment of landforms and topography is less striking, partly because many of the regional maps and diagrams, and some parts of the text, are sketchy.

This work should be studied as a whole in order to link general material, such as political history, to regional. Some readers will feel that the author has ranged too widely in one volume, at some expense in synthesis and strictly geographical emphasis. Others may welcome the fact that some attention is given, in a stimulating style, to most aspects and all areas, and every student of life and environment in the Middle East will find this volume a valuable standby. F. D. N. S.

Wells of Power. The Challenge to Islam : A Study in Contrasts. By Olaf Caroe. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. xx+240. 4 folded maps. London : Macmillan and Co. Ltd, 1951. 15*s*.

This book has appeared at a timely, and critical, moment ; and the author writes with the authority of his experience as Foreign Secretary to the Government of India. *Wells of Power* should be read carefully by all who are interested in the future of South West Asia, and particularly by those charged with looking after British interests and policy in the area centred on the Persian Gulf. And it may also be warmly commended to the notice of their colleagues in Australia and New Zealand, and to those in the United States of America whose interests are so similar.

The author describes the value of the Persian Gulf area as a great highway between East and West, whether by ancient caravan and ship or modern aircraft ; as an outpost of the defence of India and as a cockpit of international rivalries ; to which has now been added the development of oil resources on a vast scale.

He describes the building up of the British position in the Persian Gulf from their first arrival in 1616 ; their putting down of piracy, slave trade, and arms traffic ; their policy of peace on the seas and freedom of trade for all. There is a lucid description, with a simple diagram map, of the discovery and ownership of the oilfields of Persia and Iraq, and the positions of the fields and of the various pipelines to the Mediterranean—though it is well to remember that arrangements in the oil world are as changeable as the sheen on a pool of oil.

The author then shows the new dangers which have arisen from recent political and other changes : the India of British times, which was the natural base from which this area could be defended—and at various times has been defended—has been given independence and partitioned into Pakistan and India, who, with their intense disagreements, cannot be depended upon to take up the defensive rôle which was exercised from India in the past ; the State of Israel has come into being and the States of the Arab League have been unable to combine successfully ; and the shadow of Russia looms threateningly over Persia and Iraq, and their oil.

But the author does not confine himself to material matters and concerns himself to consider what the spiritual effect of these changes may be : whether Islam, born of the desert and a largely nomadic way of life, can stand up to the strain of these suddenly introduced riches and industrial conditions. He is hopeful, as Islam is still a social brotherhood, and suggests that the Islamic contribution to the confused times ahead may be the " understanding of the common humanity of man founded on the unity of God."

The author points out that, since our withdrawal from India, we are losing a great body of tradition and experience, which cannot easily be replaced. The India Office, now merged in other offices, was a great repository of official lore of India and the surrounding countries, and the Staff knew their past. It may perhaps be added that the Staff had a wide knowledge of the ' low-down ' on Eastern affairs, brought to them by a constant stream of visitors—what Curzon in a more dignified phrase called " the corporate memory of our great offices." Tentative measures are suggested to remedy this loss.

The book contains, as useful appendices, the texts of The Saadabad Pact of 1937 concluded between Iran, Afghanistan, Iraq, and Turkey ; of The Pact of the League of Arab States of 1945 ; and of The North Atlantic Treaty of 1945 ; and finally, of the Agreement on Petroleum of 1945 between the United Kingdom and the United States of America.

And from the whole there emerge two clear and dominant points : (*a*) that the most vital places to be defended in South West Asia lie grouped round the head of the Persian Gulf, and that their defence has become both more difficult and more pressing ; and (*b*) that in South West Asia, as elsewhere, only the closest co-operation, in all spheres, between the British Commonwealth and the United States of America will stave off the Russian menace. G. D. B.

Naga Path. By URSULA GRAHAM BOWER. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. x+260. 22 illustrations. 2 sketch maps. London : John Murray, 1950. Third printing, 1951. 16*s*.

For several years, including the period of the last war, Miss Bower lived among the Naga peoples on the eastern border of Assam, and in this book she gives a personal account of her many interesting and amusing experiences there. Her original work was to obtain a photographic record of various ceremonies and events of anthropological interest, and to bring much-needed medical services to outlying villages ; but when the Japanese invasion reached the borders of the territory, she found herself organising a Naga " watch and ward " to act as auxiliary to the regular forces.

In addition to being a highly entertaining travel book, *Naga Path* has also much to teach us of the problems of culture contact between Europeans and primitive peoples. The Pax Britannica has not been an undiluted benefit to these tribes : the indigenous system of shifting agriculture has been thrown out of gear without an adequate substitute being found ; traditions of war and head-hunting seem to have given way to a somewhat unattractive and treacherous decadence in some respects ; nevertheless, Miss Bower finds the Nagas fascinating as a group and succeeds in transmitting some of this enthusiasm to the reader. A. M.

This was Singapore. By R. C. H. MCKIE. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. 222. 9 photographs. London : Robert Hale Ltd, N.D. [1950]. 12*s* 6*d*.

This is a record of the thoughts and personal experiences of an Australian journalist who spent some time in Singapore to 1940. He is much more interested in people than places and in social than in historical and economic problems. It is a good introduction to the undercurrents of life and thought in this focal point of SE Asia. H. P. W.

Am Rande des Pazifik: Studien zur Landes- und Kulturkunde Südostasiens. By KARL HELBIG. 9×6¼. Pp. xii+324+40. 94 photographs. 10 sketch maps. Stuttgart: W. Kohlhammer, 1949. *DM* 19.80.

Only a long article might do justice to this *Fringe of the Pacific*. The extent of the bibliography given in the text and at the ends of chapters is formidable. So is that of the ground covered by the nine separate sections that compose the volume. The territory dealt with stretches from Further India over South East Asia to the Philippines, but the greater part of the book is a study of every aspect of land and people in Indonesia, of the impact upon them of the Chinese migrations, and of the contribution made by Europeans of many breeds to the history and development of those islands. Under the last heading the share taken by individual Germans from the time of the earliest Portuguese expeditions onwards is shown to be considerable. By the way, there is nothing of Nazism in the tone or content of this book. It was completed in 1947, at the moment when the Dutch Empire was obviously about to make way for some very different system.

An interesting feature is the space allotted to description of the towns. But the author has visited every type of country, including the homeland of the Dyaks, where even his knowledge of the Malay tongue ceased to serve him. In the account of the spread of the Chinese two striking points are brought out: military movements have had but little part in it, and from the sixteenth century Europeans have been directly and very largely responsible for the encouragement of it. On how vast a scale these migrations have taken place is shown in the statistics quoted and in the maps. There are forty pages of photographs arranged in a sequence corresponding to the sections of the text. R. T. C.

Structural History of the East Indies. By J. H. F. UMBGROVE, D.SC., HON.F.R.S.E. 12½×10. Pp. xi+63. 68 text figures. 10 plates, including folding map. Cambridge: University Press, 1949. 30*s*.

Professor Umbgrove, professor of geology at Delft, will already be known to some for his geophysical works in English. The present work is the text of certain lectures given at Cambridge in 1946.

The peculiar subaerial and submarine relief of the East Indies, together with their geological structures and sediments, volcanoes and earthquakes, and the results of the famous gravity surveys, all point to the area being one where earth-movement has taken place in the very recent past, if, indeed, orogenesis does not still continue. Thus the region may be expected to yield important clues as to the nature of geophysical processes. The various features are in turn analysed and then assembled in a final synthesis. Thus a structural history of the East Indies is reconstructed, the theoretical basis of which may be of much wider application. It is, however, only a theory, as Professor Umbgrove himself points out. As such it may be liable to modification as and when our scanty knowledge is increased.

Professor Umbgrove makes his subject pleasantly readable and his theory attractive. The book is beautifully produced and finely illustrated. H. A. M.

Mongolian Journey. By HENNING HASLUND. 8½×5½. Pp. x+232. 12 plates. Illustrations. Map. London: Routledge and Kegan Paul Ltd, 1949. 18*s*.

The Danish author, who between the two world wars made several journeys into the wilds of Mongolia and lived at various seasons in yurts with the tribesmen, has written a fascinating and informative account of the customs and superstitions of these little-known people. The book, most sympathetically written, reads like the work of a poet rather than the effort of a scientist, and at times the reader is transported back to the Middle Ages to breathe an Arabian Nights atmosphere. After two interesting interludes, one in Hainan and one in Peking, we slip through the Japanese Iron Curtain of the twenties and thirties and penetrate far into the land of Prester John and Jenghiz Khan. This is one of the few books, recently read, we wished to be longer.

In addition to naïve illustrations by the Mongolian artist, Lodai Lama, there are several photographs as well as a map and index. The translator, Mr F. H. Lyon, has done an excellent job. W. K.

China ohne Mauer. By HERBERT TICHY. 9×6. Pp. 200. 56 drawings by Chen Chih-Nung. Vienna : L. W. Seidel und Sohn, 1948. $3.25.

An easily read book on Chinese life and character, *China ohne Mauer* is written with pleasing dry humour, and some touches of irony. The author lived in Peking for years—long enough not to be dogmatic about China. " Questions dealing with the complex life of China can only," he states, " be dealt with by two or more contradictory answers." The compromise synthesis of these answers he leaves to be made by the reader. Provocative startling statements abound : " One can hardly find any people so self-satisfied about their geographical ignorance as the French and the Chinese." " China is strong and eternal—through opium." Explanation follows, and usually also the opposite view is presented as well. China according to the author thrives on compromise and finding the happy mean. Glimpses of European customs through Chinese eyes show the reader that the obvious may seem very different, though no less obvious, when the observing lens is changed. Brief quotations are made from most varied sources—all with good effect. Conceptions of ' face,' filial piety, and the like are well illustrated by ancient stories, patches of history, and modern anecdotes. The author refers to *Chinese Characteristics*, by A. H. Smith, as having occasioned several of the trains of thought in this book, the object of which is to help the reader's conjectures as to the future of the Chinese way of life after the penetration of ' Western ' inventions, machinery, and ideas into China through its unwalled eastern frontier.

Reproductions of charcoal sketches by a Pekinese artist illustrate the author's ideas about opium, the grand tradition in art, the Great Beyond (religion), woman's existence, fate, ' letting off steam,' the working man, some buildings, the life and death of a Chinese farmer whose village is robbed of all food by requisitioning Japanese, and the psychological effect of the Great Wall, fore-runner of the Iron Curtain. There is life and expression in the sketches and they make a valuable complement to the text. R. A. H.

Korea : Land, Volk, Schicksal. By HERMANN LAUTENSACH. 9½×6½. Pp. 135. 32 illustrations. 14 maps. Stuttgart : K. F. Koehler, 1950.

The author, at present professor of Geography in Stuttgart, has travelled extensively in Korea and is well read in the relevant literature—a short bibliography is included. In 1945 a much larger work on this subject was published ; it was completely sold out. While that book was addressed in the first place to geographers, the book under review, though in all respects a serious study, has been prepared with a thought also for the general reader.

The sub-title is Land—People—Destiny. The contents include in brief the substance of the earlier work along with much new interesting material, e.g. the history is brought down to the close of 1949, and the concluding chapter is devoted to a summary of the essential features of the two halves of Korea, North and South. There are sections on the geological basis, the landscape, mineral resources, climate, water supply and its exploitation, agriculture, industry, means of communication, towns, the people—their physical characteristics and mental and spiritual outlook. In many connections the Japanese occupation crops up. In spite of the great variety of topics and the necessarily brief notice of some of them, the book is very readable and should be translated. The pronunciation of place-names has received careful attention. The production of the book is satisfactory. R. T. C.

INDIAN OCEAN

Kings of the Cocos : The Story of the Settlement on the Atoll of Keeling-Cocos in the Indian Ocean. By JOHN SCOTT HUGHES. 8½×5½. Pp. xi+164. 5 figs. 16 plates. End-paper maps. London : Methuen and Co. Ltd, 1950. 15*s*.

The Cocos Islands, sometimes also called Keeling, lie in the eastern Indian Ocean. They are the fragments of an immense atoll. Probably they were known to Europe as early as the seventeenth century. Then in 1827 Captain Clunies Ross, a master mariner, looking for a peaceful home for himself and his family, formed a settlement with a number of Malays. The growth and export of coconut products

is the sole occupation. On the whole, life has been uneventful, happy and contented. There have been visits from naturalists—Charles Darwin, H. O. Forbes ; a proclamation that the atoll is British ; the foundation of a cable station ; and a call by Captain Slocum on his solitary voyage round the world. The most exciting event was the destruction of the German commerce raider *Emden* by H.M.A.S. *Sydney* in 1914. The Ross family still provides the King or, officially, the Administrator.

The book also has a chapter on Christmas Island and its rich phosphates, now sold to the governments of Australia and New Zealand. An interesting, authoritative, and welcome book. R. N. R. B.

AFRICA

The Year Book and Guide to East Africa. Edited by A. GORDON-BROWN, F.R.G.S., for the Union-Castle Mail Steamship Company. $7\frac{1}{4}\times4\frac{3}{4}$. Pp. xxxii+435+16 (atlas)+98 (advertisements). Folding map. London : Robert Hale Ltd, 1951 edition. 6*s*.

The area covered is from Egypt to Mozambique, and includes the Belgian Congo, Madagascar and other French islands, and Mauritius. The book is a mine of information for those who wish to travel by land, sea, or air, and has chapters on mountaineering in East Africa and on the fauna of South and East Africa. There is an excellent atlas of maps by Messrs John Bartholomew and Son Ltd. A very useful book. J. M. M.

Exploring We Would Go. By ELLEN GATTI. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. x+302. 32 illustrations. London : Robert Hale Ltd, 1950. 15*s*.

A very readable book. Mrs Gatti tells of her meeting with the distinguished traveller who was to be her husband, of her first expedition to East Africa and the Congo, and of her ultimate marriage there. While her personal history, particularly the oft-postponed marriage, is interesting and diverting, the main value of the book lies in the picture it gives of African scenes and life. Mrs Gatti, in spite of the extensive material equipment of the expedition, got very close to nature, sometimes by choice but also when, owing to bad luck or faulty organisation, Africa stripped them of their elaborate equipment and took charge. The authoress is a very frank and direct person, getting straight to the heart every time, and she writes accordingly. One puts down the book feeling that one has met someone worth knowing.

There are many striking photographs but unfortunately no map and, unless the reader himself provides one, much of geographical value is lost. R. M.

AMERICA

The History of Nova Scotia. By G. C. CAMPBELL. $8\times5\frac{1}{2}$. Pp. xii+288. 19 illustrations. Toronto : The Ryerson Press, 1948. $4.00.

Mr Campbell, now Principal of Sydney Academy, Nova Scotia, has given us an informed and interesting book on the history of his homeland, from its early discovery in 1497 by John Cabot—who may however, though Mr Campbell does not mention them, have been preceded as early as 1390 by the brothers Nicolo and Antonio Zeno—to present times. Dividing his story into five parts, he treats of the discovery of the land, of the bitter war in Acadia—as it was first named by the French settlers—between French and English and the tragic dispersal of the French settlers by the English in 1775 ; of the people and their farms ; and finally, of the development of the country. Of particular interest to Scotland is this land of Scots overseas, and not the least interesting part of the fascinating story of this North American peninsula is that devoted to the " Coming of the Highland Scots," for whom emigration became a necessity even before the Jacobite rebellions. Culloden, by the way, was fought in 1746 and not 1745 (p. 178).

This book will be read with interest by many others besides Scots. It is illustrated with some pleasant drawings by Donald C. Mackay, but a better map of the whole territory at the present day would add to the instruction of its readers. I. W. H.

Le Québec par l'Image. By RAOUL BLANCHARD. 9½×6½. Pp. 138. 7 figs. 54 plates. Montréal : Librairie Beauchemin Limitée, 1949.

In this short book Professor Raoul Blanchard gives a very complete and vivid account of Canada's great French-speaking province. With pleasing lucidity and enviable conciseness he treats us to a series of word-pictures of the province's geographical subdivisions, with but the briefest general introduction ; landforms, climate, economy, and settlement are dealt with fully, and generally in non-technical terms. Succinct as it is, the work never degenerates into a mere summary or catalogue of dry statistics, but maintains interest throughout.

Whilst avoiding adverse criticism of this useful and delightful little geography, one feels that it would have benefited from a more effective method of reproduction of the fifty-four full-page photographs, so well chosen to form an integral part of this picture of Quebec. A. M.

Climbs in the Canadian Rockies. By FRANK S. SMYTHE. 9×6. Pp. ix+260. Illustrations by the author. London : Hodder and Stoughton Ltd, 1950. 20*s*.

This is Mr Smythe's last book. He gained his first experience on climbing in the Rockies when he was acting as Instructor during the war to the Lovat Scouts who were sent out to the Jasper area for training in mountain warfare. He again revisited Canada in 1946 and 1947, and the book is the result of his experience during these visits.

He began by confining himself to the well-known areas of Banff and Jasper, but in the last expedition he employed the novel means of travel by float-plane so as to get to an area which was practically unexplored and in which nobody had climbed : north of the Fraser River and over 600 miles from Banff. Climbers in Europe often complain of weather conditions, but these conditions seem much more uncertain in the Rockies. One of the greatest difficulties is not actually on the mountains themselves but the restriction of movement in the forests and the time which is taken in clearing trails. To compensate for this, there is the beauty of untracked forests and uplands covered with beautiful flowers, which adds to the delight of expeditions. We hope that Mr Smythe's expedition will be a forerunner to many others. There is obviously a large area of fine mountainous country still to be explored.

The illustrations in the book do not as a whole come up to the very high standard which Mr Smythe has set in the past. A. H.

Two Captains West. By ALBERT and JANE SALISBURY. 10¾×8½. Pp. xix+235. Illustrations. 8 maps and end-paper maps. Seattle : Superior Publishing Company, 1950. $7.50.

Two Captains West is the story of the Lewis and Clark expedition sent out in the spring of 1804 by President Thomas Jefferson to explore the unknown lands west of the Mississippi, which would give the United States a stronger claim to the country between that river and the Pacific coast, the latter at that time being opened up by the British and other Europeans.

The authors have wisely followed the original journals of the two daring Captains, quaint spelling included, and their tale makes interesting reading. The small expedition, the members of which were mostly young and untried soldiers, eventually reached the Pacific coast near Pasco, Washington, near the mouth of the Columbia river, and then set out to return by the way they had come, arriving back after an interval of two and a half years, during which they had been given up for lost. Their daring journey was rich in discovery and adventure. They met hostile and friendly tribes of Indians, shot the dangerous rapids of unexplored rivers in their home-made canoes, and ran innumerable risks from wild animals, facing incredible hardships and danger of starvation on many occasions.

Included in the book are accurate directions by the authors on the way to reach to-day the most interesting points along the trail. Mrs Salisbury supplies at the end of chapters a modern ' travelogue ' on her own and her husband's experiences as they covered the trail. There are excellent maps and many fine illustrations.

I. W. H.

News from South America. By G. S. Fraser. 8½×5½. Pp. 224. 9 illustrations. London : The Harvill Press Ltd, 1949. 10*s* 6*d*.

This book is the story of a three months' visit to Brazil, Uruguay, Argentina, and Chile in the summer of 1947. As an author and poet, Mr Fraser was most interested in the literary and artistic life of these countries, and much of the book records his impressions of the leading intellectuals of Latin America, most of whom he seems to have met on his journey.

To the geographer and to those interested in current affairs, the best part of the book is the first chapter, which gives an admirable summary of the political and economic background of present-day conditions in each of the countries visited.

R. B. S.

OCEANIA

Cannibal Caravan. By Charles 'Cannibal' Miller. 8½×5½. Pp. 223. 29 illustrations. London : Museum Press Ltd, 1950. 15*s*.

This is another travel book by an American camera-man seeking—and finding—cannibals, head-hunters, fearsome jungle monsters, and an "unknown tribe." The scene is somewhere in Dutch New Guinea, apparently the extreme south-east, but not even the roughest of sketch maps is provided. The camera-man has brought back many interesting photographs of natives and, as usual, was accompanied by his wife. Again as usual, any reader who may wish to trace down the "lost race" for himself will find never a clue as to either direction or distance. C. R. V. G.

POLAR REGIONS

Svalbard : A Norwegian Outpost. 11×8¼. Pp. 172. 204 illustrations by the late Ole Friele Backer. Introduction and captions by Professor Anatol Heintz. Decorative end-paper maps. Bergen : J. W. Eides Forlag A-S, 1950. London : Bailey Brothers and Swinfen Ltd. 30*s*.

A superb collection of photographs with detailed captions comprises the greater part of this book. No aspect of Svalbard life is omitted : there are even pictures taken underground in the mines. As far as we can judge, none has been previously published. A map and an introduction by Professor A. Heintz are added. The book is in no sense scientific and discusses none of the problems of the islands, even though it mentions some.

Both Norwegian and English editions are published, the latter in faultless English rendered by Dr L. J. Wilhelmsen. Altogether this is a beautiful, authoritative, and instructive book. R. N. R. B.

ECONOMIC GEOGRAPHY

An Economic Geography of Great Britain. By Wilfred Smith, M.A. 8½×5½. Pp. xv+747. 124 figs. London : Methuen and Co. Ltd, 1949. 32*s* 6*d*.

The number of works dealing seriously, or to any degree comprehensively, with the economic geography of Britain is extremely small. Professor Smith's book fills what has hitherto been a conspicuous gap in geographical literature. It is obviously the fruit of many years of wide reading and enquiry : footnotes and references, often with detailed quotations, appear on nearly all its closely printed pages and in some cases occupy a third or more of the page. Reliance has been rightly placed on primary sources, and the meticulous care used in giving authorities for every fact is in the best tradition of Chisholm. It would be foolish to pretend that the book is light reading, and it presumes a general knowledge of British geography, especially of the physical background. Thus variation in types of farming is discussed in relationship to physical regions, the assumption being that the common regional divisions are familiar to the reader, and similarly the problems of the separate coalfields are considered without any overall picture of the disposition of the fields. This makes the whole work complementary to, rather than a substitute for, a general text-book of British geography.

In many ways its fifteen chapters are separate detailed essays and each could stand alone. The first three deal respectively with the historical development of agriculture, industry, and trade and transport. This separation from the consideration of the " present economic geography " is a little artificial, but more surprising is the treatment in separate chapters of " arable farming " and " grassland farming." It is true that grassland farming and grassland management have been traditional in parts of Britain and have long puzzled those used to New World conditions, but the swing from arable to permanent grass in the latter half of the nineteenth century was essentially a response to economic circumstances, whilst the recent trend towards " taking the plough around the farm " all over the country eliminates the distinction. Agriculture has changed so much during and since the second world war that the elaborate appendices on agriculture returns for selected counties 1870 and 1913 and for selected agrarian regions 1936 have an historical value only. This is the major criticism of the book as a whole : the " present economic geography " refers in fact to the pre-war position, and nearly all the numerous tables refer to the nineteen-thirties. Nevertheless, it is a book which must be on the shelves of every geographer and in every library, and is a lasting monument to the erudition and industry of the author. L. D. S.

BIOGRAPHY

Champlain : The Life of Fortitude. By Morris Bishop. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. 367. 8 illustrations. Map of Champlain's travels. London : MacDonald and Co. (Publishers) Ltd, 1949. 18*s*.

Samuel Champlain was the father of Canada as a settled, civilised country, and therefore one of the heroes of Canadian history. From 1603, when he first visited the Maine and Maritime Provinces region, Champlain was filled with enthusiasm for the unexplored land and its red-skinned inhabitants, and his persistence finally attracted official French attention to the St Lawrence Basin. Trade with the Indians to exchange European goods for beaver skins ; colonisation by a settled Catholic peasantry ; missionary work to bring the Indians into the Catholic fold ; and last but not least, exploration of the back country and search for a water route to China : for all these Champlain was an ardent propagandist and worker, and he lived to see his dreams on the way to fulfilment.

Mr Bishop's book deals primarily with Champlain as a courageous explorer, and the land and people are described principally to illustrate the central character. Dwelling on Champlain's piety and general goodness, Mr Bishop does not neglect the hero's shortcomings as a leader and ruler. Champlain was not entirely successful in dealing with the Indians, lack of decision and firmness occasioning future difficulties. Special attention is paid to Champlain's alleged contribution to the chronic hostility between the Iroquois and the French. One may consider the literary style inadequate to the subject, but this is, nevertheless, a scholarly book, of great interest to all who love tales of high adventure. A. M.

EDUCATIONAL

The Spirit and Purpose of Geography. By S. W. Wooldridge and W. G. East. $7\frac{1}{4}\times4\frac{1}{2}$. Pp. 176. 10 sketch maps. London : Hutchinson's University Library, 1951. 7*s* 6*d*.

This book can be thoroughly recommended to all those—and there must be many—who have ever asked " What *is* geography ? " It should certainly be read by all undertaking honours courses in the subject, for not only do the authors critically examine many well-known definitions and find them slipshod, but they also stimulate a great deal of self-examination in the reader. In no other book of this size has the whole philosophy of the subject been so adequately and carefully studied ; and the authors do well to remind us, presenting their case with great clarity, that " the central objective of geography is the study of country rather than of man," and that the social superstructure is unstable unless built upon a sound physical foundation. D. M.

Geografi for den Høgre Skolen. Bind 1. By E. Haffner and E. Knudsen. $8\frac{1}{2}\times5\frac{1}{2}$. Pp. 256. 240 figs. Oslo: N. W. Damm og Søn. Fourth edition, 1949. *Kr.* 8.50.

The title-page states that the book is published with the approval of the Norwegian Education Department for use in higher schools and training colleges. The preface indicates that it is designed to meet the requirements of the first two years in the secondary course; and that suggests more clearly the scope of the book: it offers a conspectus of the whole world, leaving out only the country of origin. It is regrettable that all school-books could not be made as attractive as this volume, which is well printed on good paper in a strong and pleasing binding, the text being enriched with a wealth of fresh illustrative material in the shape of photographs and black-and-white and tinted maps and diagrams. It is almost too fine to be exposed to the rough-and-tumble of schoolboy satchel or strap.

The first few pages contain a brief account of map-making and of essential terms. Then follows a review of the earth's surface and of the forces that have gone to make it. The section on climate discusses temperature, pressure, wind, currents, precipitation. And under the heading "Nature and Culture" the natural environment is shown in relation to human civilisation from the most primitive to the modern machine age.

The articles on the separate regions and countries of the world are taken up in a rather unconventional order: Africa, Indian Ocean, Pacific, Asia, Oceania, South Polar Region, America, Atlantic, Europe, ending with Scandinavia without Norway. Some ten pages are devoted to the British Isles. R. T. C.

This Modern Age: An Introduction to the Understanding of Our Own Times. By F. C. Happold. $7\frac{1}{2}\times5$. Pp. xv+328. 51 figs. London: Christophers. New edition, revised, 1949. *7s 6d.*

It is not the slight geographical interest that gives this book a claim to notice but its width of outlook and balanced view of the background of modern life, the way in which our country is governed and the story behind our foreign policy. The book is designed for the upper forms of schools, but there is much in it that older people might read with advantage. The maps and diagrams are well drawn.
R. N. R. B.

Map-Reading for Schools. By Margaret Wood, B.Sc. $10\times7\frac{1}{2}$. Pp. 66. 39 figs. 15 photographs. 11 maps in colour. London: George G. Harrap and Co. Ltd. New edition, revised, 1950. *6s.*

Geography teachers will welcome this new edition of Miss Wood's well-planned book. It has been brought up to date by the inclusion of extracts from the New Popular One-Inch Map in place of the Fifth Edition and Tourist Maps of the first publication. The section on Ordnance Survey Maps has been rewritten and partly devoted to the use of the National Grid.

The maps have been well-chosen to illustrate typical relief forms, and the accompanying diagrams and photographs are invaluable. It is unfortunate that economic considerations will doubtless prevent its wider use in secondary schools.
J. L. H.

Intermediate Map Reading. By Thomas Pickles. $9\frac{1}{2}\times7$. Pp. vi+41. 68 figures. 6 air photographs. 6 O.S. maps. London: J. M. Dent and Sons Ltd, 1949. *3s 3d.*

A text-book, for the 15-year-old class, with little joy attending it. As the many practice exercises indicate, it is designed for pre-examination work, and in this sphere the book is best where dealing with the representation of landforms by contour. A variety of maps is studied, the 6 in., the $2\frac{1}{2}$ in., and the 1 in. to the mile, as well as several air mosaics. The selection of Ordnance Survey maps, from the point of view of Scottish schools, however, is unfortunate, as all the extracts given deal with English areas, none with Scotland, lowland or mountain. A. C.

GENERAL

Herdsmen and Hermits : Celtic Seafarers in the Northern Seas. By T. C. LETHBRIDGE, M.A., F.S.A. Foreword by T. D. Kendrick, F.B.A., F.S.A. $7\frac{1}{2}\times5$. Pp. xix+146. Frontispiece. 27 figs. Cambridge : Bowes and Bowes Ltd, 1950. 10*s* 6*d*.

A fascinating book. Mr Lethbridge surveys the evidence of early people in Iceland, Greenland and America, of voyages across the North Atlantic, the Greenland Sea and Davis Strait. It has all been done before, but here is a fresh point of view, coupled with a belief in the seaworthiness of frail boats. Pytheas, Thule, the Celts in Iceland, the Norsemen in Greenland, Labrador and Vinland—they are all here, and many other topics of human interest.

The book merits attention from chapter to chapter. It is brief but scholarly, and it is never dull. Maps and diagrams enhance the value of the book.

R. N. R. B.

ATLASES, MAPS, GAZETTEERS

Webster's Geographical Dictionary : A Dictionary of Names of Places with Geographical Historical Information and Pronunciations. $9\frac{3}{4}\times6\frac{3}{4}$. Pp. xxxi+1293. Maps in the text, and 24 coloured maps. Springfield, Massachusetts : G. and C. Merriam Co., 1949. London : G. Bell and Sons Ltd. 80*s*.

The publishers of *Webster's New International Dictionary* have now issued a very well produced volume containing " a selection of geographical proper names adequate for the needs of the general user." The number of place-names listed is considerably smaller than that supplied in certain gazetteers of the world, but more than 40,000 names have been selected with due regard to their historical and special interest. The editorial staff and consultants, under the general editorship of John P. Bethel, have produced a substantial work of reference designed primarily for the North American user.

The minimum population of towns and villages accepted for entry is 1500 for the United States and Canada ; 3000 for the Union of South Africa ; 5000 for the British Isles, Australia, New Zealand, and the South American republics excepting Brazil and Argentina ; 10,000 for Western and Central Europe, Argentina, and Brazil ; 20,000 for India and the Philippine Islands ; 25,000 for the U.S.S.R., China, and Japan. These criteria are modified, however, in the case of places of special interest : Aberfoyle, Balmoral, Inveraray, the Lorelei, Lidice, Longyear City, for instance, are included.

The space allotted to individual entries also tends to show North American bias : three lines for St. Andrews, Fife, four for St. Andrews, New Brunswick ; five lines for Greenock, ten for Prince Rupert ; six for Dundee, fifteen for Galveston ; six for Portsmouth, fourteen for Portsmouth, Virginia ; twenty-three for Southern Rhodesia, thirty-seven for the Bahamas. Bull Run occupies more space than Austerlitz, and Bikini more than Waterloo ; Charleston, S.C., more than Baghdad ; etc.

It is inevitable that population statistics will have to be revised in any future edition. The very few slips—Loch Menteith, for instance—are venial in a scholarly work of this magnitude. The particulars given in the lists of United States and Canadian National Parks, as well as of the counties of individual States, are useful. In spite of the North American bias, this " quick-reference source of geographical information " will be appreciated, even if to a lesser degree, in other parts of the English-speaking world.

J. H. K.

The Regional Atlas of the World. By JOHN BARTHOLOMEW, M.C., M.A., F.R.S.E. Introduction by Professor A. G. Ogilvie, O.B.E., F.R.S.E. $11\times8\frac{1}{2}$. Pp. xvi+160 +96. Edinburgh : The Geographical Institute, 1948. 45*s*.

As another excellent publication lending popular credit to Scottish map-makers, this Regional Atlas should find a place in every layman's library. The Atlas is primarily designed to familiarise its users with the physical configuration rather than the political colouration of the various regions of the world. The introduction by Professor Ogilvie—on the ' regional ' idea behind the Atlas—will prove invaluable to the inquiring user.

M. Y. N.

Bartholomew's Handy Reference Atlas of the World. 8×5. Pp. 32+159 maps+159 pp. General Index. Edinburgh : The Geographical Institute. Fifteenth edition, 1949. 25*s*.

This *Handy Reference Atlas*, with its wealth of information, is admirably suited to office use. The 15th edition affords an opportunity for delinquent libraries and offices to make good. M. Y. N.

Edinburgh—Atlas and Guide. Designed by BARTHOLOMEW. 7¼×5. Pp. xvi+31. Historical notes and places of interest. Edinburgh : John Bartholomew and Son Ltd, 1950. 3*s* 6*d*.

The latest addition to a popular series of atlas-guides maintains the excellent standard of its predecessors. One may safely predict it will find its way into many a visitor's pocket this summer, for in addition to the usual clear maps and street index there are historical notes—laudable in their brevity—and a valuable list and plan of city transport routes. Altogether a useful and handy compendium. D. M.

GLENMORE LODGE

The Scottish Centre of Outdoor Training was established shortly after the war at Glenmore Lodge, which is situated close to Loch Morlich, about five miles east of Aviemore and four miles north-west of Cairn Gorm (4084 ft.). Advantages of the site include accessibility, relatively low precipitation (averaging 35 inches), and an environment suitable for a great variety of outdoor pursuits. The Centre is sponsored by the Scottish Education Department for an experimental period of three years ending in September 1951.

High-level expeditions on foot or ski, and climbs on snow, ice or rock are supplemented by field studies of the landforms and weather, and of related changes of flora and fauna within a small area, adding to the training and physical exhilaration of the mountaineer guidance in the appreciation of scenery. Originally an adjunct to instruction in mountaineering, field studies are now organised in four-week courses for school boys and girls alternately during periods when Glenmore Lodge is not used for the single-week vacation courses for adults. Indoor lessons tending to stress the integration of topographical, geological, meteorological, and biological observations thus supplement instruction in map and compass reading and in mountain craft, including way-finding, equipment, and safety measures.

A reference library is being built up, and photographs, films, and lantern slides are being added. Equipment for recording weather conditions has been provided by the Meteorological Office. As the Central Highlands are inadequately covered in the existing network, the weather station at Glenmore Lodge, together with additional snow and rainfall stations to be established at higher levels on the slopes of Cairn Gorm, will provide useful data.

Further developments are adumbrated in the use of Glenmore by members of teachers' Training Colleges and of relevant University Departments. Accommodation provided for visiting scientists and advanced students will contribute also to the promotion of research projects.

Recreational facilities are enhanced by Loch Morlich, with its fine sandy beach and a stretch of water available for rowing, sailing, and swimming.

[Abstract of a note by Mr Robin Murray, B.Sc., Glenmore Lodge, Aviemore.]

THE WORLD LAND USE SURVEY

A Survey has been formed to carry out the recommendations of the World Land Use Commission of the International Geographical Union. The Old World division of the new organisation, under the direction of Professor L. Dudley Stamp, was established in London on 1st January 1951.

The World Land Use Survey is intended to provide the fundamental and utilitarian work upon which development schemes can be based, and without which development schemes may cause more harm than good. One of the basic problems involved in the promotion of international good-will is, of course, that of producing enough food : preventing physical starvation for vast numbers of human

beings, securing an adequate nutritional standard for all, and maintaining this standard relative to the growing demand of an increasing world population. An urgent need, therefore, exists for an inventory or survey of the present utilisation of the earth's surface.

The first object of The World Land Use Survey is to record the actual use of land in all parts of the world on a uniform system of classification and notation, with any necessary local amplifications. The second object is to secure the publication of results. It is proposed that a world map on the scale of 1: 1,000,000, together with explanatory memoirs, shall be published, and that on the individual sheets the scale of the original maps and degree of reliability of the information shall be indicated. In under-mapped countries the accurate representation of conditions of land use may involve new techniques of surveying and mapping : interpretation of aerial photographs, for instance.

Individuals and groups who are able and willing to undertake field surveying in parts of the Old World should communicate with John Callow, Esq., B.A., Organising Secretary, The World Land Use Survey, Royal Geographical Society, Kensington Gore, London, S.W. 7.

SEVENTEENTH INTERNATIONAL GEOGRAPHICAL CONGRESS

The Seventeenth International Geographical Congress is to be held in Washington, D.C., August 8-15, 1952. Four excursions are planned, two of which will be offered both before and after the Congress.

The transcontinental excursion (August 17-September 13) will include a journey by air from Washington to the eastern edge of the Rocky Mountains, the trip through the western part of the country being by train and 'bus. The leader, Dr John Leighly, University of California, has arranged for several geographers to join the party at different times to discuss areas with which they are personally acquainted. The tentative itinerary of an excursion (July 27-August 3) to be led by Dr Derwent S. Whittlesey, Harvard University, includes stops in each of the six New England States and a brief stay in Canada. The Southern excursion, led by Dr Harold Miller and Dr J. Russell Whitaker, and an industrial areas excursion led by Dr Harold Mayer and Dr Lester E. Klimm, are both scheduled for July 27-August 3 and August 17-24.

The major part of the Congress program will be devoted to sectional and Commission meetings, the remaining time being allotted to general sessions and to two General Assemblies for official International Geographical Union business.

In conjunction with the Congress, the Third Consultation on Geography of the Pan American Institute of Geography and History will be held in Washington in July ; the Centennial Celebration of the American Geographical Society, August 4-6, in New York City ; and the Seventh International Congress of Photogrammetry, September 4-15 tentatively, in Washington. The consolidated schedule of events, preliminary program, and other particulars are given in *The I.G.U. Newsletter*, January 1951.

Arrangements for British geographers to attend the International Geographical Congress will be centralised through the British National Committee for Geography. Geographers intending to go to the Congress are invited to inform Mr D. C. Martin, Assistant Secretary, The Royal Society, Burlington House, London, W. 1.

ROYAL SCOTTISH GEOGRAPHICAL SOCIETY

PROCEEDINGS

Meetings of Council were held on the 16th January, 6th March, 22nd May, and 3rd July, 1951.

Awards.—1950 : The Livingstone Medal was awarded to Professor Alan G. Ogilvie, O.B.E., for his notable services to Geography. In particular, the distinguished and scholarly manner in which he has occupied and developed the first Chair of that subject in Scotland.

The Mungo Park Medal was awarded to THOR HEYERDAHL for his leadership, courage and enterprise in navigating the *Kon-Tiki* raft from South America to Polynesia.

The Scottish Universities Medal (1951) was awarded to PATRICIA ANN MACGILCHRIST, First Place, General Classes, 1950-51, St. Andrews University; NORA A. MCINTOSH, for conspicuous excellence throughout the Junior Honours Class, 1951, Glasgow University; JOHN RICHARD MASSON, Final Year Honours Student, 1951, Aberdeen University; JOHN BEWSEY, for general excellence throughout the Courses, 1947-51, Edinburgh University.

ANNUAL GENERAL MEETING

The Annual General Meeting will be held in the Society's Rooms in Edinburgh on Tuesday, 9th October 1951, at 4 P.M.

LECTURE SESSION, 1951-52

OCTOBER-DECEMBER, 1951

EDINBURGH, *Usher Hall*

EVENING MEETINGS, at 7.30 P.M.

October 18th. HEW FITZROY MACLEAN, M.P., on "Escape to Adventure." Fitzroy Maclean commanded the British Military Mission to the Partisans in Jugoslavia 1943-45.

November 15th. Dr DOUGLAS GUTHRIE, on "An Aesculapian on Safari." A Vice-President and former Chairman of Council, toured in South and East Africa in 1951.

December 13th. Major GEORGE SHERRIFF, O.B.E., on "Wanderings in Tibet." George Sherriff served in the Political Service in Chinese Turkestan and Tibet. He travelled extensively in the Himalayas in search of plants.

Central Hall, Tollcross

AFTERNOON MEETINGS—Wednesdays, at 3 P.M.

October 24th. Miss I. W. HUTCHISON, LL.D., on "A Stroll Through the Dolomites, 1950."

November 7th. Dr H. I. DREVER, on "The Scottish Greenland Expedition, 1950."

November 21st. Colonel NIALL RANKIN, on "A Wild Goose Chase."

December 5th. Dr H. FAIRHURST, on "The Anglo-Egyptian Sudan."

December 19th. The Rt. Hon. LORD BELHAVEN, on "South West Arabia."

The Society's Rooms

NEW DEVELOPMENTS IN GEOGRAPHY

Thursdays, at 5.15 P.M.

October 11th. Professor ALAN G. OGILVIE, O.B.E., on "Co-operative Research on SE Scotland: The Next Step?"

November 8th. DUNCAN STEWART, O.B.E., on "Cattle on Scottish Hills."

December 6th. J. B. FLEMING, M.A., and F. H. GREEN, M.SC., on "Scottish Towns as District and Regional Centres."

JUNIOR MEMBERS' MEETINGS—Tuesdays, at 7.30 P.M.

October 23rd. JAMES HOSSACK, M.A., B.COM., on " Industrial Films."
November 20th. Miss I. W. HUTCHISON, LL.D., on " A Walk to London from Edinburgh."
December 18th. A Foreign, Dominion or Colonial Lecturer on " My Country and my People."

Synod Hall

FILM SHOWS FOR YOUNG PEOPLE

Mondays, December 24th and 31st, at 10.30 A.M.

GLASGOW, *Lyric Theatre*, at 7.30 P.M.

October 17th. HEW FITZROY MACLEAN, M.P., on " Escape to Adventure."
November 14th. Dr DOUGLAS GUTHRIE, on " An Aesculapian on Safari."
December 12th. L. M. HARPER GOW, on " Modern Whaling in the Antarctic."

ABERDEEN, *Y.M.C.A. Hall*, at 7.45 P.M.

October 16th. Major GEORGE SHERRIFF, O.B.E., on " Tibet."
November 13th. Dr DOUGLAS GUTHRIE, on " An Aesculapian on Safari."
December 11th. K. WALTON, M.A., on " The Aberdeen University Expedition to Cyrenaica, 1951."

DUNDEE, *Training College Hall, Park Place*, at 7.30 P.M.

October 17th. Major GEORGE SHERRIFF, O.B.E., on " Tibet."
November 12th. Dr DOUGLAS GUTHRIE, on " An Aesculapian on Safari."
December 12th. K. WALTON, M.A., on " The Aberdeen University Expedition to Cyrenaica, 1951."

NEWBIGIN PRIZE : 1951 AWARD

A Bronze Medal and Money Prize will be awarded for the best Essay, suitable for publication in *The Scottish Geographical Magazine* and not exceeding 7000 words in length, on any subject relating to the geography of Scotland.

Essays, typed and with any illustrations prepared for reproduction, in envelopes marked " Newbigin Prize," must be lodged with the Secretary, Royal Scottish Geographical Society, Synod Hall, Edinburgh 1, on or before 31st October 1951.

NOTICE

In view of the great demand from overseas, the following numbers of *The Scottish Geographical Magazine* are very urgently required :

Vol. **2**, Nos. 3, 10, 11 ; Vol. **13**, No. 11 ; Vol. **19**, Index ; Vol. **20**, Nos. 1, 5 ; Vol. **22**, Nos. 3, 6 ; Vol. **25**, No. 8 ; Vol. **26**, No. 3 ; Vol. **34**, Nos. 3, 4, 10, 12 ; Vol. **35**, Nos. 1, 2, 3, 8, 9 ; Vol. **36**, No. 1 ; Vol. **37**, Nos. 1, 2, 4 ; Vol. **40**, Nos. 2, 4 ; Vol. **41**, Nos. 1, 2, 6 ; Vol. **47**, No. 6 ; Vol. **53**, No. 1 ; Vol. **58**, Nos. 1, 2, 3 ; Vol. **59**, Nos. 1, 2 ; Vols. **58-59**, Index ; Vol. **60**, No. 2 ; Vol. **61**, No. 2 ; Vols. **60-61**, Index ; Vol. **62**, No. 3.

Bound volumes will also be gratefully accepted. It would be much appreciated if such copies of separate numbers and of volumes be handed without delay to the Secretary.

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